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THE NATIONAL TELEPHONE MAGAZINE

TELEPHONE ENGINEER AND Management

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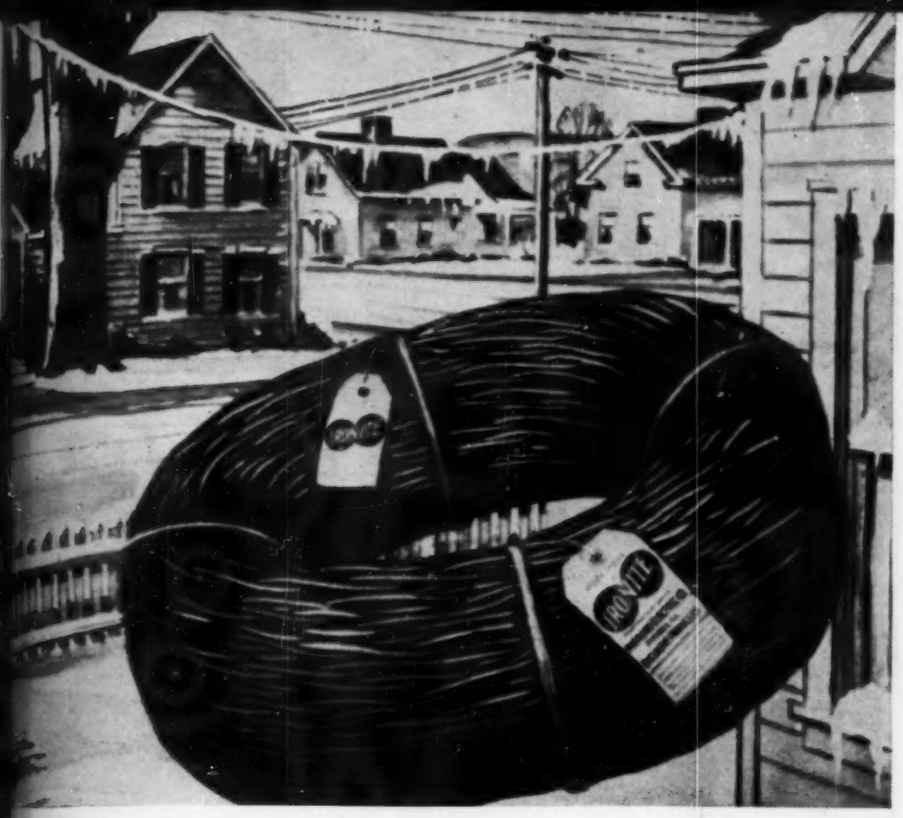
FEBRUARY 1944

QUALITY TOOLS

FOR LINEMEN



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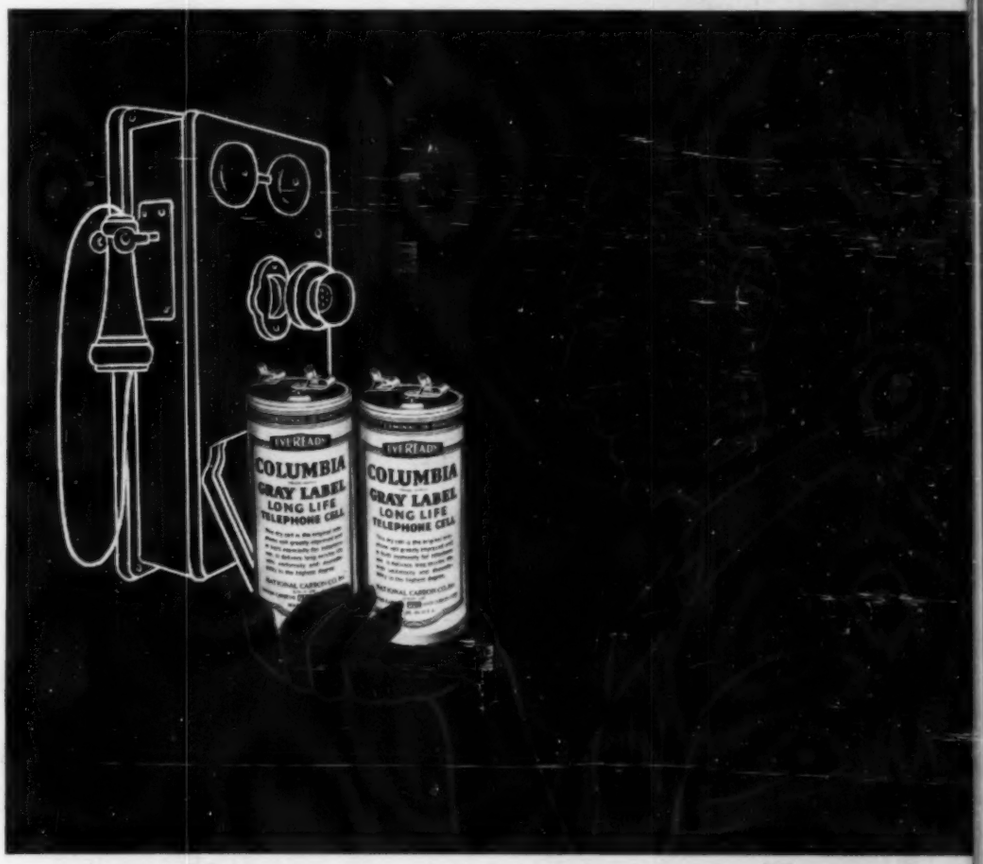
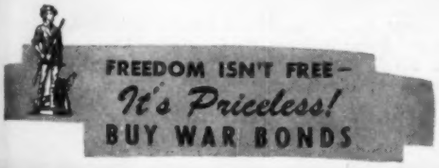


It's a Tough Life they lead—but "Eveready" "Columbia" "Gray Label" Long Life Telephone Cells don't weaken. Product of the world's largest dry battery laboratory at NATIONAL CARBON COMPANY, INC., they can be depended on for sustained voltage (which assures sustained high transmission efficiency) . . . for extra hours of life . . . for uniform high quality. These cells are used by more Independent telephone companies than any other brand.



LINE UP WITH *Kellogg* FOR LINE SUPPLIES ★

The Prince of Peace

There stands a Temple of Miracles,
Wrought by the hand of God,
At the end of the road of doubtfulness,
Where the non-believers trod.

They who tread this winding pathway,
Need not give up in despair,
For in this house of ancient wonders,
Modern miracles, too, are there:

Lest we forget The Dots and Dashes,
Sending thoughts along a wire;
The voice that spoke in a Cone-like Tube,
And could be heard afar.

The Cylinder of Wax that sang and talked,
An unreality?
The astounding Wireless, that S. O. S.
A Saviour on the Sea.

The amazing Carriage without a Horse,
That chugged when rolling by;
The big Box Kite from earth detached,
That man sailed through the Sky.

The life that came to a Silver Screen,
By light through celluloid;
The Magic Box with earphones that,
Brought music out of void.

That unconquerable Spirit of Freedom,
That stopped the Jap and Hun
Since our Country's greatest peril,
December, Forty-one.

When we prayed for Strength and Wisdom,
In deep humility;
Our prayer to God was answered,
Thank Him—Our Nation's free.

Thank God for that Greatest Miracle—
May His influence never cease—
Thank God for that First Christmas,
When He sent the Prince of Peace!

By Edgar H. Kilbourne
Fort Wayne, Indiana

TELEPHONE ENGINEER & MANAGEMENT

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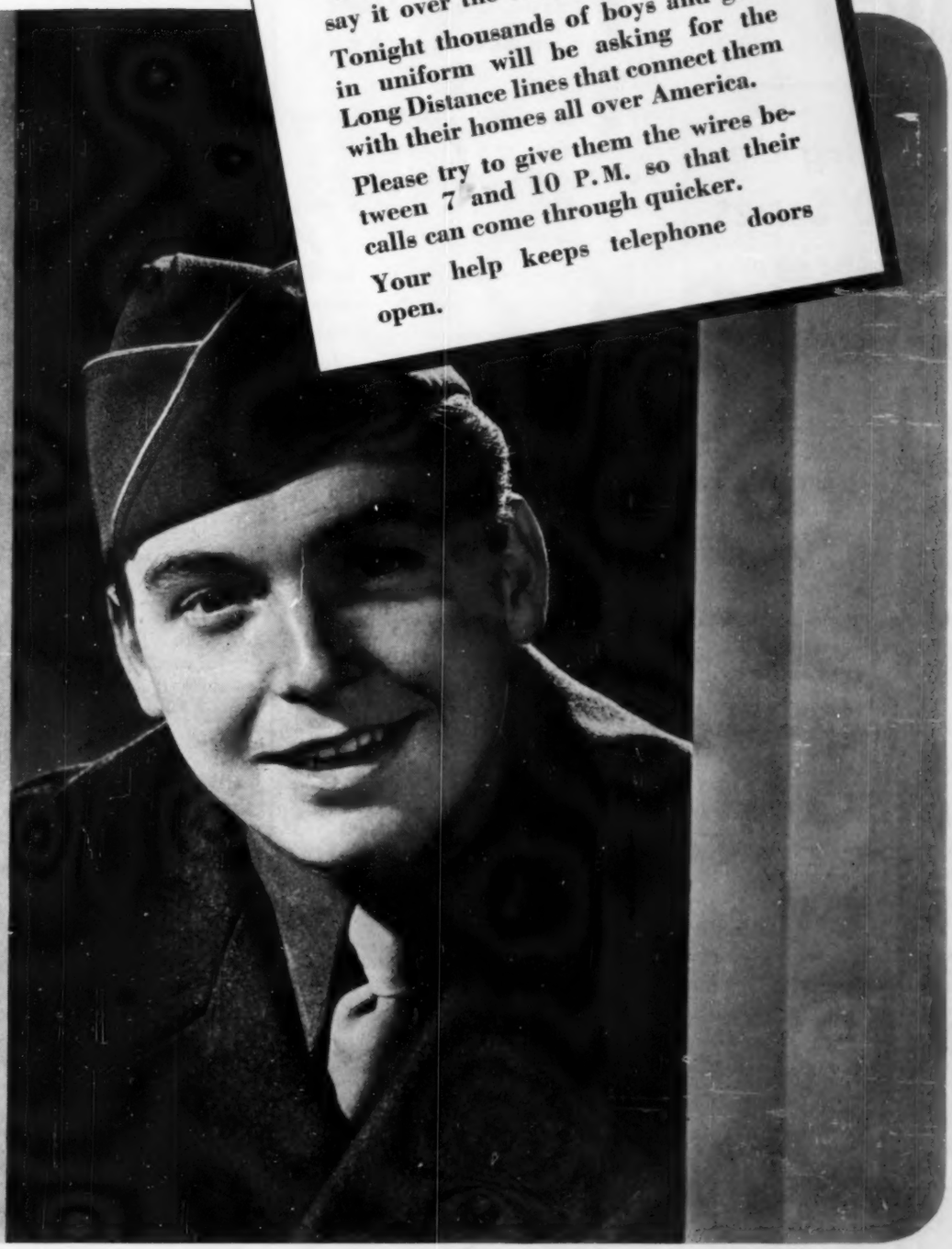
"Hi, Mom, It's Me"

The next best thing to having a soldier open the door at home with "Hi, Mom, It's Me" is to hear him say it over the telephone.

Tonight thousands of boys and girls in uniform will be asking for the Long Distance lines that connect them with their homes all over America.

Please try to give them the wires between 7 and 10 P.M. so that their calls can come through quicker.

Your help keeps telephone doors open.



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3. Provide Convenience
4. Increase Revenue

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Why not check your paystation lines now, and look for the added possibilities in your locality?

WRITE FOR CATALOG 4078

A complete reference to all types of Gray Paystations as well as a guide book to the best kind of paystation to suit your particular needs. Write for it today—it's yours for the asking.

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25 YEARS AGO THIS MONTH

Taken from TELEPHONE ENGINEER files of February, 1919.

Twenty-five years ago TELEPHONE ENGINEER printed Mr. Theodore N. Vail's letter to the Postmaster General announcing the invention of the multiplex telephone. At that time an installation of the multiplex telephone system had been in service for a month between Baltimore and Pittsburgh. Thus, over a single pair of wires a total of five telephone conversations operated simultaneously. Before this, the best telephone methods provided only one telephone conversation at a time over a single pair of wires.

★

On January 28, 1919, by a vote of 10 to 8, the House Postoffice Committee decided to report a bill providing for the continuance of government control of telephone and telegraph until December 31, 1919.

★

Postmaster General Burleson's toll schedule went into effect January 21, 1919. Many state supreme courts, however, made public an order restraining telephone companies from putting into effect the increased toll rates.

★

In small Illinois towns, twenty-five years ago, business houses protested very severely over the new rule of the Chicago Telephone Company which prohibits the operators giving the correct time.

★

The Chicago, Rock Island and Pacific Railroad announced that telephones instead of telegraph be used in dispatching trains on their Missouri division.

★

At a meeting of the Michigan Telephone Owners Association in Grand Rapids, Michigan, a committee was appointed to handle the work of preparing uniform toll line rates for the 1,234 stations and arrange for new rate books in connection with putting into effect the new toll line rates ordered by Postmaster General, Burleson. The committee was comprised of Roy F. Mapes, C. E. Smith, W. E. Hutchins and R. C. Smith.

When life depends on uninterrupted telephone service

...Raytheon RectiFilteRs

(battery eliminators)

provide dependable power

Uninterrupted telephone service in hospitals is vital for protecting health and life. That is why so many hospital administration executives and telephone companies select Raytheon RectiFilteRs for the power supply. They know from experience that Raytheon RectiFilteRs always provide dependable power whether the traffic demands be light, normal or heavy. And because RectiFilteRs provide uniform D. C. output voltage, they assure proper operation of automatic telephones. Raytheon RectiFilteRs are entirely automatic in operation . . . they have no moving parts . . . and require no maintenance.

A complete bulletin showing the advantages of Raytheon RectiFilteRs is available on request. Write for a copy.

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RAYTHEON MANUFACTURING Company

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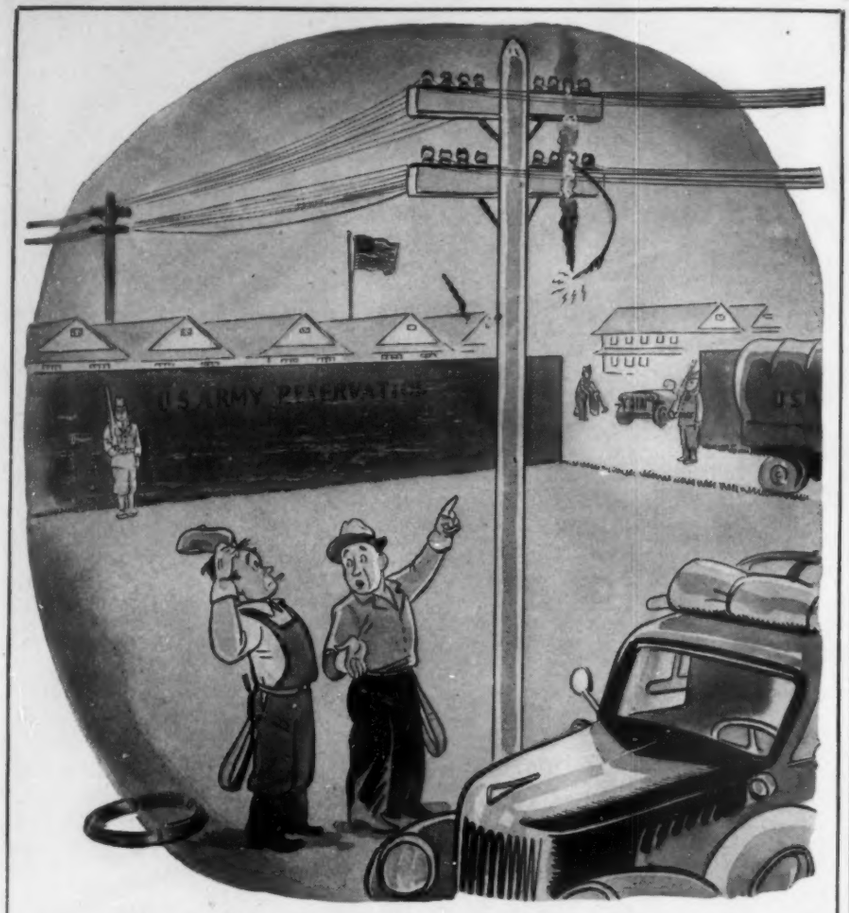

"EVER SINCE BETTY GRABLE VISITED THE CAMP, THAT LINE TO HOLLYWOOD HAS BEEN BURNING OUT!"

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Call Your Local Graybar Representative

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GRAYBAR *men know the business*—they have a background of experience that begins with the beginnings of the industry itself. Their service to independent telephone companies all over the country gives a broad range of knowledge in meeting emergencies which accompany floods, ice storms, wind storms.
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LETTERS

from TELEPHONE ENGINEER readers

Editor's Note:
Following is a letter which was incorrectly reproduced in January FORTNIGHTLY TELEPHONE ENGINEER.

Dear Sir:

In the interest of accuracy we feel called upon to point out to you certain errors occurring in your account of the decision of the Supreme Court of Washington in the Pacific Telephone & Telegraph Company case, appearing on page 29 of your November 1943 issue. The heading reads as follows: "Supreme Court Decision Reversed on Washington State Rate Order." The error is apparent as the case was before the Supreme Court and therefore its decision could not be reversed. It may be that the heading was intended to read as follows: "Supreme Court Decision Reverses Washington State Rate Order."

Also in the fourth paragraph of the article, the following erroneous statement appears: "The State Supreme Court held that a fair rate of return was not less than 6 per cent whereas the Department had found 5 per cent as a fair rate." The fact is that the State SUPERIOR Court had held that a fair rate of return was not less than 6%. This finding of the Superior Court, however, was reversed in the Supreme Court decision and the department finding that 5 per cent was a fair rate of return was affirmed.

Very truly yours,
Department of Public Service
By A. E. Rotchford, Secretary

Dear Mr. Smith:

I am a subscriber of the TELEPHONE ENGINEER AND MANAGEMENT which I believe is the best magazine on telephony that I have seen. There is one thing in your magazine which is of especially great interest and that is the "Handbook Tables." Do you have a book with the complete tables? If not, do you know of a book that will have complete tables on telephone engineering? These tables will be very useful to me as a marine and also when I return to my old company.

Very truly yours,
W. E. Freeburn, Sgt.
Communication Platoon
Marine Barracks
Quantico, Virginia

(Marine Freeburn will have to wait until paper is available as no book of Tables is available now.—Ed.)

Highlights of the Communications News

Important Communications developments of the past month, briefed for busy readers

by

ROLAND C. DAVIES
Editor, Telecommunications Reports

Rate Reduction

THE $8,000,000 annual reduction in interstate telephone and teletypewriter rates, which was achieved as a result of negotiations lasting over a number of weeks between the FCC and the American Telephone & Telegraph Company and which is effective March 1, has some important effects for the Independent telephone industry as well as for the Bell System, that will have to be developed as the result of experience with the rate revisions.

The major portion of the reduction, estimated to amount to more than $5,600,000, will result from the lengthening of the present reduced night rate for interstate long distance telephone calls so as to have the night rate period start at 6 p. m. instead of 7 p. m. This will undoubtedly be reflected into reduced toll divisions of the Independents, but there are advantages for a number of companies in that it spreads the toll traffic load which in territories where there are large Army or Navy establishments reaches a peak around 7 p. m. which often is higher than the load during the heighth of the business day. However, some Independents have found difficulties in the rearranging of the new schedules for the night "tricks" of the toll operators. The Long Lines Department will bear most of this reduction, approximately $5,000,000 and the Bell Companies the remaining $600,000.

Another portion of the reduction under which the overtime rates for teletypewriter message service would be reduced to the same basis as now exists for overtime rates for long distance telephone service is estimated to produce savings to users amounting to $2,350,000 per year. This reduction in TWX rates places the overtime at one-fourth the initial-period rate when the latter is over 30 cents instead of the present charge of one-third the initial-period rate. It is felt that this lowering of the TWX overtime rates may have some effects on the overall revenues of Independents and the subject is now being studied by the USITA officials.

Hotel Surcharges

IN another action, consummated jointly by the FCC and the District of Columbia Public Utilities Commission, the Independents have an important interest. It deals with the surcharges, collected by hotels, apartment houses and clubs, for long distance and local telephone calls above the regular telephone rates—of course, NONE of the revenues from these surcharges, not a single cent, comes to the telephone companies.

The FCC has promulgated an order, covering long distance telephone calls in Washington, D. C., that banned surcharges for such service and it is estimated that this will bring the telephone-using public savings of more than $1,700,000 annually. The prohibition against the long distance hotel surcharges became effective Feb. 15. The FCC, however, approved an arrangement with the hotels, etc., under which the American Telephone & Telegraph Co. and Bell System companies can pay a 15% commission for interstate telephone calls on gross charges to the hostelries.

At the same time, for local calls the District of Columbia Commission has not worked out a very satisfactory pattern as far as the telephone companies are concerned. The proposal of the Chesapeake & Potomac Telephone Co. which serves the National capitol for a 5-cent surcharge to be imposed by hotels, etc., on local calls of transient guests and a flat dollar a month service charge for permanent guests was rejected by the Commission and was the subject of a hearing Feb. 12. This is the pattern which prevails in many states under the approval of State Commissions. For example, this surcharge arrangement, with some variations, is utilized in New York, New Jersey, Pennsylvania, Virginia, West Virginia, Maryland, Indiana, Wisconsin, Minnesota, Nebraska and in a number of large cities such as Cincinnati, Kansas City, Milwaukee, etc. Meanwhile, it was understood authoritatively that the Hotel Association of Washington, D. C., is seriously considering a court test—an injunction against the FCC long distance ban and an appeal from the D. C. Commission order, both to be taken in the Federal District Court in the District of Columbia.

Continuing Property Record

SUBSTANTIAL progress has been made by the U. S. Independent Telephone Association in encouraging Independent companies to file their plans for the establishment of Continuing Property Records in regard to their telephone plants. Practically the entire Independent industry has now submitted their plans to the FCC. It is possible that the Independent industry, however, may seek a postponement of the effective date of

AT THE MINNESOTA CONVENTION

•

TELEPHONE ENGINEER Editor Ray W. Smith discusses the Minnesota program with J. W. Howatt of Northwestern Bell and Minnesota Association Secretary, J. C. Crowley, Jr.

the Continuing Property Record, although this reporting of changes in telephone plant investment is slated to become effective as of the originally projected date for the Bell System.

Independents on RTPB

THE U. S. Independent Telephone Association has secured representation on the Radio Technical Planning Board panels which are now devising ways and means for postwar allocation of radio frequencies. President Harold V. Bozell of the General Telephone Corporation has been designated a member of Panel 8 which deals with Radio Communications. B. C. Burden, USITA Telephone Engineer, has been appointed a member of Panel 9 which deals with Relay Systems by radio. As a member of the radio manufacturing industry, vice-president and general manager R. H. Manson of Stromberg-Carlson Co. likewise represents the Independent telephone manufacturing industry on the Spectrum Utilization Panel of the RTPB.

Spring Conference

THE Spring Conference of the U. S. Independent Telephone Association, which will be held in Chicago, is understood is to be more of a closed affair than in the past. In other words, every effort is being made by the Association leadership to have attendance carefully confined and restricted to the top executives of the Independent companies.

Wage-Hour

THE Federal Wage-Hour Administration is expected to hand down its decision in regard to the projected 40-cent per hour minimum wage, being imposed in the communications field immediately, instead of waiting for the statutory date of its effectiveness of October, 1945, by the latter part of March or early April. If Wage-Hour Administrator L. Metcalfe Walling decrees the immediate imposition of the 40-cent minimum wage at this time, it is anticipated that an interim period of 15 days or a month will be allowed the telephone companies to revise their wage schedules to meet the increased minimum pay level.

A decision also will in all probability be promulgated in connection with the proposal of the Independent telephone industry for the extension of the so-called learner operator period of training at sub-minimum wages from 320 hours to a longer period of several months. The USITA had asked the Wage-Hour Administration to extend this learner period to a full year, but it is not anticipated that such a long time will be granted.

Convention Dates

Texas Telephone Association, Baker Hotel, Dallas, March 13 and 14.

Kansas Telephone Association, Jayhawk Hotel, Topeka, March 16 and 17.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, April 11 and 12.

Nebraska Telephone Association, Hotel Fontennelle, Omaha, April 13 and 14.

Illinois Telephone Association, Edgewater Beach Hotel, Chicago, April 18 and 19.

Spring Executive Conference, United States Independent Telephone Association, Edgewater Beach Hotel, Chicago, April 20 and 21.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 25 and 26.

Indiana Telephone Association, Serverin Hotel, Indianapolis, May 3 and 4.

Wisconsin State Telephone Association, Park Hotel, Madison, May 10 and 11.

Pennsylvania Independent Telephone Association, Berkshire Hotel Reading, May 17 and 18.

New York State Telephone Association, Hotel Syracuse, Syracuse, May 24 and 25.

United States Independent Telephone Association, Stevens Hotel, Chicago, October 10, 11 and 12.

Missouri Telephone Association, Place not decided, November 21 and 22.

In the arguments before the Wage-Hour Administration during the latter part of January, William I. Aitken, USITA Counsel, contended that the recommendations of the Wage-Hour Industry Committee No. 69 for the immediate imposition of the 40-cent minimum were "not made in accordance with law" and were "not supported by evidence". The Committee No. 69 made its recommendations after a single day's session.

Mr. Aitken assailed the proceedings at the October hearing with the remark that "there was form without substance, there was a conclusion and recommendation without evidence in support, and there was action of the Committee without investigation or deliberation." His presentation was strongly supported by R. J. Sutherland, Counsel for the Commonwealth Telephone Co., the Illinois Commercial Telephone Co., the Indiana Associated Telephone Co., the Michigan Associated Telephone Co. and the Lexington, Ky., Telephone Co. J. Perry Walters, owner of the Central Iowa Telephone Co. also appeared in opposition to the Committee's recommendation. Some observers felt that the Independents might be laying a foundation for a court appeal.

Added $6,000,000 Wages

MR. AITKEN cited that the immediate effect of the increased wage rate for switchboard operators in the Independent telephone industry would be the elimination of 10,560 operators' jobs due to curtailment in special telephone services and other operating adjustments, and eventual conversion to dial operation would mean the elimination of an additional 35,489 operators' jobs. Another effect would be to impose on the companies in the Independent Group at least $6,000,000 of additional annual wage costs, or a general increase of approximately 10.3% over present payrolls. He noted that the Independents operated on a low profit margin, roughly a 4% return.

In a sweeping censure of the October proceeding, Mr. Aitken said "if hearings of this character may be deemed an investigation of conditions in the telephone industry throughout the nation, and meet the requirements for investigation imposed by Congress, then the justification for sustaining the constitutionality of the law itself is undermined and emasculated." He stressed that, if the recommendation is approved, the order issued by the Administrator "will be predicated solely upon non-judicial and non-legislative action" and "will in complete disregard of the congressional intent and of the rights of the Independent Telephone group afforded protection under the Constitution of the United States." He asserted that approval of the Committee's recommendation would be to "disregard and overrule the years of established practice and precedent in the regulation of the telephone industry in this country, both by Federal and State Administrative agencies."

Wage Progression Upset

MR. AITKEN told Administrator Walling that there was complete failure on the part of the Industry Committee "to take into consideration the relevant factors" which required the establishment of classifications within the telephone industry, and to classify the Independent Telephone Companies as a separate group for establishing proper

wage rates. Evidence offered by the Independents was "completely disregarded" in this respect, he stated. He brought out the Independents served a total of more telephones than there are in both England and France.

Mr. Sutherland, who made an excellent factual presentation, cited the imposition of the 40-cent minimum would "throw out of kilter" all existing wage progression scales in the industry, and said the Independents "had no trouble" obtaining switchboard operators to work at wages prevailing in the industry in the small towns and rural communities.

Double Number of Leaders

UNLESS the operators' learner period in the Independent telephone industry is lengthened substantially from its present 320-hour limit under sub-minimum wage rates, curtailment of opportunity for employment will result and the Wage and Hour Administrator "will have failed to have carried out the mandatory directives imposed upon him by Congress" to prevent any such occurrence. This statement was the highlight of the brief submitted to the Wage and Hour Division of the Department of Labor by the United States Independent Telephone Association in its application to increase the learners period to one year at sub-minimum wage rates.

Because of the expectation that the Wage and Hour Administrator will approve the recommendation of Industry Committee No. 69 for a minimum wage limit of 40 cents per hour from the present rate of 30 cents, the USITA brief proposed as a preventive against curtailment of opportunity for employment in their industry, a graduated scale of learners' rate. Under this wage schedule, a learner would be paid 25 cents per hour for the first three months of training; 30 cents for the next 3 months; 32½ cents for the next 3 months; and 35 cents per hour for the last three months. "This rate," it was argued, "would encourage employment of operators; provide the normal standard of living to the learners; prevent curtailment of opportunities for employment by permitting the employers to maintain a full staff of operators; and is a rate which will attract and hold switchboard operators in the Independent telephone companies."

The USITA also asked for a revision of the Order of April 9, 1940, which limited the number of learners that could be employed, and requested that the number of learners that may be hired in each classification be doubled.

European Rehabilitation

THE Government authorities have just launched a survey of the prospective needs for the rehabilitation and restoration of the European Continent as the occupied nations are liberated by the British-American invasion, if all goes well. The study is still exploratory and only formative at this stage, but it marked the first time that communications has been formally brought into this picture although other utilities of electric light and power, gas and water have been under scrutiny for some time.

The agency which is studying the communications situation is the U. S. Utility Operating Committee of the Combined Utilities Committee which is headed by J. A. Krug, Director of the WPB Office of War Utilities and WPB Vice Chairman in charge of Requirements. Director Leighton H. Peebles of the WPB Communications Division attended the initial meeting of the Utility Operating Committee when communications was brought into the picture early in February and a subcommittee to concentrate on the telephone requirements in the liberated areas is to be established, probably under Mr. Peebles' leadership.

The outlook is that the American telephone manufacturing companies will furnish in the main the telephone equipment which will be needed by the Army to establish emergency communications for the military forces and for the civilian population in the invaded areas where the Germans destroy existing telephone systems as they have done in Italy. These requirements already have been mapped out by the Signal Corps with the American companies.

UNRRA After Army

UNDER the present plan the Army through the Allied Military Government organization is to carry on the operations of communications, probably for months, while the area is in the theatre of war operations. The minimum requirements for a civilian population include the furnishing of service necessary for police and fire protection, hospitals, physicians, banks, and principal businesses and manufacturing industries, together with food distribution concerns—in other words, the users are more or less like the group in the WPB Schedule A listing. When the Army relinquishes its responsibility for an area, the United Nations Relief and Rehabilitation Administration is then slated to supervise communications operations.

What the future program of the restoration of telephone and telegraph services on the European Continent will be remains to be blueprinted. The United States telephone manufacturing companies, it is known, will be kept very busy when peace comes in supplying the needs of the telephone systems in this country. Depending upon the extent of the destruction of the manufacturing facilities in Europe, it is considered doubtful that American manufacturing companies in this field will be called upon to do much more than has been allotted to them this year by the Army. However, two American companies—the International Standard Electric, the manufacturing affiliate of the International Telephone and Telegraph Corporation, which has manufacturing plants under different corporate designations in England and throughout the Continent, and the Automatic Electric Company—will play a most important part in the postwar production of telephone equipment in Europe.

European Factories

BECAUSE Europe has different standards and types of telephone

(Please turn to page 40)

General Bawled Out, Takes It With a Grin

Brig. Gen. William S. Rumbrough, chief signal officer, European theater of operations, tells this story:

Sgt. Richard Redding, 27, North Kingsville, Ohio, was stringing telephone wire atop a 30-foot pole in Sicily, "utterly oblivious to waves of Messerschmitts coming in over a low hill to his back."

"Redding presented a perfect target," Rumbrough said, "but he worked on, so engrossed that he failed to identify the general who had driven up to hail him from the foot of the pole:

"'Hey, soldier, what are you doing up that pole?'

"Without looking down, Redding shouted, 'working!'

"'How long have you been up there?' the general asked. Redding said about 20 minutes.

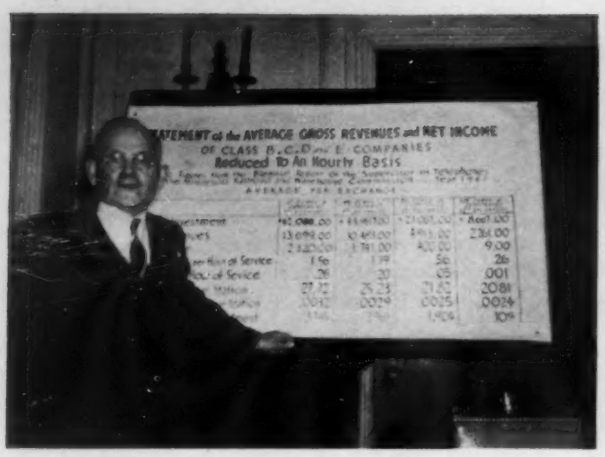
"'Don't the planes bother you?' the general yelled.

"'Hell, no, but you do!' Redding replied.

"The rest of Redding's crew at the foot of the pole gulped, but the general turned away, smiling."

The general was George S. Patton.

The story appeared in Radio News.



At the Minnesota Telephone Association convention, Secretary J. C. Crowley, Jr. (left) explains the chart compiled by the Minnesota Commission on average revenues and net income reduced to an hourly basis. (Right) These Directors and Advisory Council members of the Association were interested listeners while the chart was being discussed.

Minnesota Convention Report

By RAY W. SMITH, Editor

THE 35th Annual Convention of the Minnesota Telephone Association was held in Minneapolis on January 25, 26 and 27. Its program was an unusual one as state conventions go because of the cooperative efforts of the Minnesota Railroad & Warehouse Commission, representatives of the United States Independent Telephone Association and the members themselves in their Open Forum Discussion arranged by secretary treasurer J. C. Crowley, Jr.

All association officers were re-elected. They are: Warren B. Clay, Hutchinson, president; H. F. Lueders, Norwood, vice president and J. C. Crowley, Jr., secretary treasurer.

The following directors were elected for a 3-year term: G. M. Dwelle, Lake City; W. A. Eckles, Blue Earth; H. F. Lueders, Leland Wright, Alexandria, and S. A. Rask, Blooming Prairie. Those elected for a 2-year term were: P. M. Ferguson, Mankato; J. P. Keane, Pine Island; Vies Martinsen, Sebeka; F. C. Marvin, Zumbrota, and Fred Pfaender, New Ulm. Those elected for 1-year were: Charles Cashel, Worthington; W. B. Clay; P. A. Glaeser, Waconia; H. P. Sentmen, Fairmont, and Irving Todd, Hastings.

The tenor of the program as a whole was in regard to the smaller companies and their many problems under the wartime economy. Secretary Crowley presented a well diversified program with outstanding speakers and was rewarded by having a larger attendance than in all past years. As there was much for the smaller companies almost 100 more than usual were represented.

Perhaps the most important feature of the entire program was the stress laid upon the necessity of more adequate revenues. A chart, prepared by Supervisor of Telephones of the Minnesota commission A. N. Fancher, was prepared and shown during the meeting that reflected the true picture of the different classes of companies by revenues. We are reproducing this chart in this report. The cooperation of the state commission is such in Minnesota that in most cases Mr. Fancher in company with Mr. Crowley travels through the state by car to see that good service is rendered the people and that the operating company has sufficient revenues to furnish good service. This type of cooperation with state commission is an ideal one and eliminates loss of time, expense and the minimum of detail for the commission to act.

The program proper started with the address of president Warren B. Clay. His report for the Association year included discussion of all subjects of timely importance with particular emphasis on postwar planning, necessity of adequate rates and how they might be obtained to provide good service during wartime and later. He paid tribute to the United States Independent Telephone Association especially mentioning the good work of the Toll Compensation Committee.

Secretary Crowley, Director P. M. Ferguson and Minnesota Association president Warren S. Clay, who was re-elected, preside at meeting pictured above.

The other feature speaker at the opening session was R. C. Reno, Chicago, who had as his subject "Small Telephone Companies Must have Help—and Quick". He suggested various ways in which this could be done. He paid a tribute to the Minnesota commission on their cooperative efforts in Minnesota that is resulting in better service to the people with adequate rates for the operating companies.

Mrs. Phillip Pillsbury appeared as a representative of the American Red Cross to explain its functions and make a plea for more blood donations. She explained the coming drive for funds scheduled for March.

The morning of the second day began with G. B. Foscue, Chicago, chairman of the USITA Co-ordinating committee and president of the Independent Pioneer Telephone Association, addressing the open session. He outlined the history and aims of the Pioneer association and made an appeal, to those eligible, to join by submitting their names to the secretary J. K. Johnston, Lemcke Bldg., Indianapolis, for action by the membership committee. Mr. Foscue has been an unusually active president of the Pioneers and many new members have been accepted since his election last October.

As Minneapolis is famous as headquarters for cedar poles J. P. Wentling, wood technologist of the Consolidated Treating Company, had as his convention subject "Production of Cedar Poles". He covered his subject most thoroughly describing all phases of production and treatment for longer wear. He appealed to the telephone people present to bear with their pole suppliers because of the manpower shortage that has caused an under supply to develop. He suggested an immediate survey be made as to future needs that the pole companies might know the needs and plan for them. He also suggested that "pool" orders be used because of transportation shortage.

R. A. Lumpkin, Mattoon, Ill., president of the Illinois Southeastern Telephone Co., WPB Communications Branch adviser and director of the USITA, represented the National association and addressed the convention on the subject "Clinical Notes on Industry Problems". Mr. Lumpkin is an entertaining speaker with the ability of proving his points.

In answer to a self-imposed question "Will the WPB react as quicly to an increased supply of materials as it has to shortages and what may we expect in the way of a relaxation of limitations when there is a definite improvement in the material situation?" Mr. Lumpkin replied:

R. A. Lumpkin, Mattoon, Ill. and Washington, D. C. represented the USITA as did the National Association secretary, Charles C. Deering from Des Moines. (Right) TELEPHONE ENGINEER'S G. S. (Jerry) Gill is interviewing Mr. Lumpkin.

"Now there is a question in respect to which we might best consult the specialist, Mr. Leighton H. Peebles of the Communications Division itself, but to quote from my own notes on this subject, the answer to this question is briefly, "The limitation orders of the WPB are dictated by what can be fairly foreseen as to the probable future supply of critical materials and the availability of manufacturing facilities, and it may properly be expected that these orders will be tightened up or let out as the current situation may require or warrant". This answer is based upon my own intimate knowledge of the fact that the orders promulgated by the Communications Division are the result of many months of arduous work and careful planning on the part of both an understanding and sympathetic governmental agency and a competent and cooperative industry group made up of practical operating men from the field.

"That is a definite declaration of my personal esteem for Mr. Peebles and his staff and it may be added that no agency in Washington with which our industry has had to deal is more highly regarded than the Communications Division of the War Production Board."

We quote another question and answer discussed by Mr. Lumpkin:

"Can anything be done to relieve the manpower shortage in our industry? This is a problem that promises to take on even greater proportions in 1944. Military withdrawals from the ranks of telephone employees will be comparatively low, for after all nearly 75% of such employees are women. Telephone women, nevertheless, are likely candidates for all branches of the service in which women are eligible for enlistment. The chief economist of the F.C.C. recently estimated that not less than 187,500 telephone people will leave their jobs during the current year. This is about ⅓ of the number currently employed. Their replacement is not only a major recruiting job, it presents the difficult problem of training.

Miss Zina Ackmann, Redwood Falls, Minn. is startled by our flash bulb. Major C. B. DeWitt, Mrs. J. C. Crowley, Jr. and Mrs. DeWitt all were interested in general sessions.

P. M. Ferguson, Mankato (left) and Automatic Electric's R. H. Burfeind (right) are questioning WPB Communications Branch Director, Leighton H. Peebles, Washington, during the Minnesota Convention.

Mrs. Jessie Patton, (left) and Sec. Crowley's secretary, Mrs. W. E. Motzko read the current TELEPHONE ENGINEER while Leich Sale's DeWitt Gibson registers at Minnesota.

"The telephone industry has long been recognized as an essential war industry and certain classifications of occupations therein have been designated as critical for the purposes of deferment. If the operation of the Selective Service System threatens to take a key employee whom you feel is irreplacable, there should be no hesitancy in putting the matter definitely before your Local Board. Call their attention to the War Manpower Commission's Memorandum 115 B. Of course you may encounter a really hard boiled draft board, one that is trying to make a record of never having granted a deferment or maybe they have a tough medical examiner who long ago gave up examining eyes and now merely counts them. In any event there is still the possibility of appeal. As a last resort you may apply to the Communications Division of the WPB. When conditions warrant their intervention, you will find in them a capable champion of your cause."

Rollin G. Johnson, Commissioner of the Minnesota Railroad & Warehouse Commission, was a very welcome speaker to the telephone men of Minnesota. His tribute to the Commission's supervisor of telephones, A. N. Fancher, explained the feeling of the Commissioners in regard to the telephone companies operating in Minnesota. As could be expected his remarks had mostly to do with financial matters in the way of rates and financial conditions of the operating companies. Of particular interest to the smaller companies was the expression of Commissioner Johnson when he stated that his Commission was sympathetic to the condition of the smaller exchanges and they (the commission) was ready to consider their needs when proper application is made and certain conditions exist. The chart prepared by the Commission and mentioned earlier in this report indicated a most cooperative attitude could be expected as the chart clearly indicated a revision of rates is necessary in many instances if good service is to be rendered the people of Minnesota.

Mr. Johnson indicated the Minnesota commission was particularly favorable to private ownership of public utilities as in the past it had been the method of successful operation and should be continued. Report of the Financing and Auditing Committee ended this session.

The afternoon program was opened by a professional speaker DeLoss Walker, Chicago, with the subject "The Jap—The Unknown". He was in favor of eliminating them!

H. R. Kurth, Hutchinson, Minn., president of the Minnesota Banker's Association, had as his subject "Looking Forward". His talk likened the Independent telephone industry to the independent banking business with emphasis on private enterprise. He viewed with alarm the trend toward federal regulation and control. He particularly stressed the importance of a financial reserve for post-war expansion in the telephone field.

The address of Leighton H. Peebles, director of the Communications Division of the WPB, was carried in condensed form in our issue of Fortnightly TELEPHONE ENGINEER of February 1. We made a special effort to bring this to you as quickly as possible and was able to do so with the assistance of our Washington correspondent Roland C. Davies who edited the address.

The banquet was held the evening of the 26th with entertainment and dancing following the banquet.

At the concluding session P. E. Fader, district manager, Southern Division, Northwestern Bell Tel. Company was the opening speaker with the subject "Our Rural Problems". He outlined the program planned and completed by his company to combat the loss of rural subscribers experienced during the depression and warned the Independent operating companies in the rural areas that they must give the farmer the service he wishes and to charge him what it costs. He cited statistics to prove his contention by announcing that his company was serving 1,800 more rural customers than they served during 1931 their peak year before the depression. At the same time he stated the Independents had to increase their sub-

(Plase turn to page 40)

STATEMENT OF THE AVERAGE GROSS REVENUES AND NET INCOME OF CLASS "B", "C", "D" & "E" COMPANIES REDUCED TO AN HOURLY BASIS

Basic Figures from the Biennial Report of the Supervisor of Telephones to the Minnesota Railroad and Warehouse Commission—Year 1941

—Averages Per Exchange—

	10 Class "B" Companies 77 Exchanges	46 Class "C" Companies 97 Exchanges	75 Class "D" Companies 96 Exchanges	126 Class "E" Companies 127 Exchanges
Capital Investment	$62,088.00	$43,987.00	$21,067.00	$ 8,667.00
Gross Revenues	13,699.00	10,483.00	4,913.00	2,261.00
Net Income	2,320.00	1,741.00	400.00	9.00
Gross Revenues per Hour of Service	1.56	1.19	.56	.26
Net Income per Hour of Service	.26	.20	.05	.001
Gross Revenue per Station	27.72	25.23	21.82	20.81
Hourly Gross Revenue per Station	.0032	.0029	.0025	.0024
Ratio Net Income to Capital Investment	3.74%	3.96%	1.90%	.10%

This chart created much talk at the Minnesota Convention.

USITA Committee Analyzes Amended WPB Orders

War Activities Bulletin No. 9

Analysis of Changes in Order U-2 As Amended January 20, 1944

The War Activities Committee of the United States Independent Telephone Association have analyzed Changes in Orders U-2 and U-3 issued in Amended form as of January 20, 1944. We are reproducing both of these Bulletins for your records.

THIS memorandum discusses the principal changes in Order U-2 as amended January 20, 1944.

The paragraph and numbered designations which appear below are in the same form as they appear in the order.

Conservation

(b) (2)—The former provision that operators "shall discontinue the placing of open copper wire in exchange line plant" has been revoked.

Revocation of this provision does not mean that copper open wire may be placed in exchange plant without limitation, but rather that the direct prohibition against its use has been removed. As a result of the elimination of this provision copper wire may now be used in exchange plant under the following circumstances:

(1)—To serve Schedule A or pay station service.

(2)—To serve others provided an appeal from paragraph (g) of order U-2 is made to the Communications Division and approval received.

Limitation on Drop And Block Wire

(e)—Whereas the former order exempted only Schedule A **business** service or essential public pay station service from the drop and block wire limitation provisions, the revised orders exempts **any Schedule A service** or essential public pay station service from these limitations.

This change is for the purpose of including Schedule A residence service in the services which are exempt from the limitations covering the number of spans of drop wire which may be placed.

Limitation on Replacements

SEVERAL new praragraphs have been added relative to replacements. These new paragraphs provide that replacements of equipment and facilities **can be made** for the following situations not permitted by the old order.

(f) (2)—"In making an addition, to the extent that the cost of material replaced or of the replacing material does not exceed 25% of the cost of the total material added."

For example, if a new position is being added to an existing exchange switchboard and the total cost of the addition is $1,000, then incidental replacements necessary in connection with the addition would be permitted to the extent of material or equipment valued up to $250 (25% of $1,000). It should be understood that this provision permits replacements only in connection with additions not otherwise restricted by other provisions of the order.

(f) (8)—"To replace left in telephone stations so that a subscriber may retain the same type telephone stations after a change of address within the same exchange area or to a contiguous exchange area of the same operator."

For example, a subscriber moving from one location to another, and whose present telephone is a handset, may ask that any existing left in telephone at the new location be changed to a handset.

(f) (9)—"To install amplifying equipment for the hard of hearing." Previously it was necessary to file an appeal for permission to install this type of equipment when replacement of an existing instrument was involved.

(f) (10—"To recover insulated drop wire from the existing plant to the extent required for current operations."

This means that cable or open wire may be installed to replace drop wire provided the drop wire to be recovered is reuseable or repairable and is needed elsewhere for current operations.

Committee on Postwar Plans and War Activities of USITA

E. C. Blomeyer, Chairman, Chicago
W. M. Angle, Rochester, N. Y.
H. V. Bozell, New York
C. D. Brorein, Tampa
Alden Hart, Abilene, Kan.
R. A. Lumpkin, Mattoon, Ill.
R. A. Phillips, Sioux Falls, S. D.
John R. Porter. Tarboro, S. C.
Lloyd Wright, Jamestown, N. Y.
B. C. Burden, Secretary, Washington

Limitation on Additions

(g) (2)—Exchange central office equipment, or exchange line plant additions may now be made for Schedule A residence service where facilities cannot be made available through regrading or disconnection. A further addition to this paragraph provides that whenever cable is added to provide for known or fairly anticipated needs of Schedule A or essential public pay station service, additional cable conductors totaling not more than 200 lbs. of copper may be included for non-Schedule A requirements.

However, it will be necessary either: (1)—To use the minimum standard size cable required to provide for the known and fairly anticipated needs of Schedule A and essential public pay station service, or (2)—To limit the weight of copper in any cable conductors in excess of those required for these purposes to 200 lbs. When the exercise of this second option indicates a total number of pairs differing from a standard size cable, the limit will be the next smaller, rather than the next larger standard size.

(g) (4)—Operators are now permitted to install exchange central office equipment provided that 75% or more in cost of material required for the added C.O.E. is recovered from the operator's plant or obtained from any operator's stocks.

For example, a $1000 C.O.E. addition would be permitted provided material amounting to at least $750 could be obtained from the operator's stocks or from the stocks of other operators, or recovered from the operator's plant. It should be noted particularly that material taken from the operator's stocks or from plant pursuant to this new provision **must not be replaced.**

(g) (5)—Operators are now permitted to make cable or exchange line rearrangements or extensions which are warranted by sound engineering practices to care for non-Schedule A service, provided that in no single instance no more than 200 pounds of copper in the case of cable or 50 pounds of steel in the case of wire shall be used.

The term "sound engineering practices" is understood to mean practices that a Company would normally follow and which are not extravagant or wasteful in the use of material or manpower.

Engineering and Planning

(k)—Whereas the old order required that replacements and additions to both exchange and toll plant (either C.O.E. or outside plant) be based on certain limiting growth margins, the new order requires that only **central office equipment** be limitied as to specific growth margins for periods not to exceed 1½ years.

In other words, exchange line plant and toll line plant are no longer subject to the limiting provisions with respect to growth margins and may now be engineered on a sound basis, and in accordance with normal practice, subject of course to the exchange line plant limitations of paragraph (g).

Reports

(m)—Whereas the previous order required that records covering the use of steel and iron wire and number of main telephone stations connected for substantial food producers be kept and preserved for two years, the new order **revokes** this record requirement. Records on hand should be preserved for the two year period.

Date of issue
January 24, 1944

Useful Data on Cable and Steel Wire

THE following information should prove useful in computing the length of cable or open wire extensions or rearrangements permissible under the poundage limitations imposed by Order U-2. Total copper weight for certain popular size cables is given. For cable sizes not included, the total weight per thousand feet can readily be computed by the use of the weight factors shown.

Copper Conductor Weights

The weights of the copper conductor used in cable per 1000 feet are:

Gauge	Single Conductor Lbs. per 1000 ft.
28 gauge	0.484
26 gauge	0.769
24 gauge	1.220
22 gauge	1.940
19 gauge	3.900

Copper Content—Popular Size Cables

The total conductor weight per 1000 feet for the most popular size cables are:

Cable Size		Lbs. per 1000 ft.
101	28	97.77
51	28	49.37
26	28	25.17
16	28	15.49
101	26	155.34
51	26	78.44
26	26	39.99
16	26	24.61
101	24	246.44
51	24	124.44
26	24	63.44
16	24	39.04
101	22	391.88
51	22	197.88
26	22	100.88
16	22	62.08

Steel Conductor Weight

The weights of the steel conductors used in open wire lines are:

Wire Size	Single Conductor Lbs. per 1000 ft.	Single Conductor Lbs. Per Mile
14 B.W.G. (.083 in.)	18.75	99
12 B.W.G. (.109 in.)	32.20	170

Date of issue January 24, 1944

War Activities Bulletin No. 10

Analysis of Changes in Order U-3 As Amended January 20, 1944

THIS memorandum discusses the principal changes made in Order U-3 as amended January 20, 1944.

The paragraph and numbered designations which appear below are in the same form as they appear in the order.

Definitions

(a) (1)—The definition of an "operator" has been rewritten so as to mention specifically persons operating rural

(Please turn to page 47)

Telephone Engineer's TRAINING COURSE

☆ ELECTRICAL FUNDAMENTALS FOR THE TELEPHONE MAN ☆

Transformers---Part IX

General

ONE of the most important single items of electrical equipment is the transformer. The transformer is essentially a device for transforming or changing alternating current voltages from some given voltage to either a higher or a lower voltage. Transformers are also extensively used in audio circuits for impedance matching purposes, which incidently merely means stepping voltages up or down so that sources of unlike impedance can work together without loss in power. It consists essentially of three basic parts, an **imput winding**, an **output winding**, and a **core** on which two or more windings are placed. Figure 38

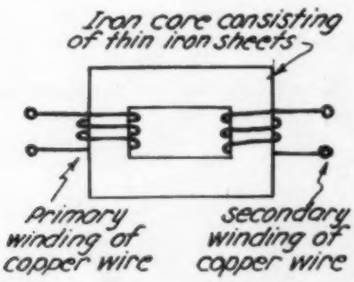


Fig. 38. Basic parts of transformer

illustrates the basic parts of a transformer.

The core can consist of either a non-magnetic material such as wood, fibre, or air, or some good magnetic material, such as iron or steel.

Transformers used in power and audio work generally have iron cores while those used in radio work usually have air cores.

Theory of Operation

THE theory of operation of the transformer is as follows: Referring to the schematic diagram it will be noted that the two windings are referred to as **primary** and **secondary.** Generally speaking, the primary is the input or voltage source winding and the secondary is the output winding. If an alternating current circuit is connected to the primary winding, a current flow through this winding takes place. This current flow magnetizes the core and inasmuch as the current is alternating in character, the magnetic flux alternates from a minimum to a maximum value and periodically reverses its direction. This increasing and decreasing flux in the core "cuts" the secondary windings in much the same manner that a wire is cut by flux when the wire is moved through a magnetic field.

The secondary winding being cut by the expanding and contracting magnetic lines of force, has generated in it a voltage. If apparatus is connected to this winding, this voltage is effective in sending current through the apparatus. Thus energy can be transferred from the primary winding to the secondary winding even though these are not metallically connected together.

Figure 40 shows the two types of cores in common use and the method of assembly from flat sheets.

Relationship Between Windings

THE voltage, current, and power relationship in a transformer depend on a number of factors. The following rules should be learned as they are important:

1.—The voltage ratio between the primary and secondary windings of a transformer is directly proportional to the turns ratio. For example, if we have twice as many turns on the secondary winding as on the primary, our secondary voltage will be double that of the primary.

2.—The current ratio between primary and secondary windings is inversely proportional to the turns

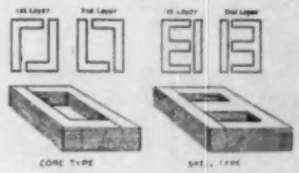


Fig. 40. Two types of transformer cores in common use

ratio. For example, if we have twice as many turns on our secondary as primary our secondary current will be one half that of the primary.

3.—The power rating of a transformer will depend on the amount of iron and copper it contains and method of cooling.

4.—The impedance matching ratio of a transformer is equal to the square of the turns ratio. For example, if a transformer is to match two impedances whose values are 10 and 1000 ohms respectively, then the turns must be 1 to 10, i.e.:

$$\sqrt{\frac{Z^p}{Z^s}} = \frac{T^p}{T^s} = \sqrt{\frac{1000}{10}} = 10 \text{ (turns ratio)}$$

5.—In addition to having the correct turns ratio for a given application transformers must also have sufficient turns on the windings to limit the no-load current to a very small value.

Effect of Using Wrong Transformer

IT is quite important that those working with transformers have a good understanding of their limitations. To illustrate, a small door bell transformer may be designed for reducing 110 volts to six volts, yet such a transformer could not be used for an application requiring let us say 20 amperes at six volts, as the wire would be too small to carry this current. Where a transformer is not large enough capacity for a given application it will either overheat or due to its high internal impedance it will not deliver its rated voltage when overloaded. When an incorrect impedance matching transformer is used in an audio circuit it will usually affect the quality of the speech or music transmitted through it, and it will also cause a loss in power.

Transformer Capacity

THE student should note that we can take no more power out of the secondary of a transformer than we put in the primary. In other words, the transformer does not make power, but merely transforms it from one form to another, as for example, from a low voltage-high current source to a high voltage-low current source. The amount of power that can be drawn from a transformer depends upon the size of the core and the size of the wire used in windings. A small bell-ringing transformer has a rating of only 25 to 50 watts; hence, very little power can be drawn from it. If, for example, one of these bell-ringing transformers which are designed for 110 volt circuits has a secondary winding rated at 6 volts, this does not mean that this winding will furnish 6 volts under all conditions but only when 25 watts or less of power is drawn from the winding. Therefore, if we attempted to use this 6 volt winding to furnish 50 amperes to our circuit it would not be suitable, and if a low resistance which would permit this current to flow were connected across the 6 volt winding, it would, in effect, "short circuit" the winding so that the transformer would either burn out or the voltage would drop to a low value due to the internal voltage drop in the transformer. This is obvious, inasmuch as we would be trying to draw 50 × 6 or 300 watts of power from a 25 watt transformer.

Types of Transformers

TRANSFORMERS such as are used to supply power for house lights and which are to be found on poles which carry the high voltage distribution lines of a power company are generally rated at from 1 kilowatt to 10 or 25 kilowatts, depending upon the load served. These transformers are capable of delivering relatively high currents of several hundred amperes. They have large cores and large size wire, and in addition, the core is enclosed in an iron case with oil which facilitates cooling and serves to better insulate the windings of the transformer.

Transformers such as are used in radio power supplies have ratings of from fifty to several hundred watts. Students should make every effort to fully familiarize themselves with the power transformers used in radio work, as these have many applications.

Transformers Used in Audio And Radio Circuits

TRANSFORMERS which are used in circuits are but little different from power transformers. The same relationship as to the voltage induced in primary and secondary holds for these transformers. The principal difference between the typical audio and the power transformers lies in their iron core. In general, because of the necessity of eliminating distortion and losses, audio transformers are made with a slightly smaller gauge and higher quality iron than is found in power transformers. Typical audio impedance matching transformers are shown in Figure 43.

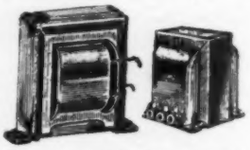


Fig. 43. Typical impedance matching transformers for audio circuits

Impedance Ratio Of Transformers

IN DEALING with audio transformers we are inclined to think of their **impedance ratio** rather than their voltage ratio. This is brought about by the necessity for matching impedances in audio or sound work. For example, if the impedance of a vacuum tube is 1,000 ohms and the impedance of a loud speaker is 10 ohms, a loss of power and considerable distortion would result from connecting the 10 ohm speaker to the 1,000 ohm vacuum tube. However, by interposing a transformer whose impedance ratio was 100 to 1 the high impedance of the vacuum tube could be stepped down to the low impedance of the loud speaker and no power would be lost and the circuit would work very satisfactorily.

The impedance ratio of a transformer is proportional to the square of the turns ratio. In other words, if we have a transformer whose turns ratio is 1 to 10 then its impedance ratio will be the square of this or 1 to 100.

Necessity for Impedance Matching

Without going into a great deal of detail as to why the necessity for impedance matching, consider it purely from the power standpoint. All devices such as loud speakers, motors, etc., require a certain amount of power to operate them. If they are designed so that they use a low voltage, then they must necessarily have a fairly high current to supply a given amount of power. If they are designed so that they have a high voltage, then the current may be relatively small in order to work on the same amount of power, inasmuch as power is equal to voltage times current. Now, if we have a speaker having a 10 ohm winding and we have a vacuum tube whose impedance is 1,000 ohms and we wish to transfer power from the high impedance vacuum tube to the low impedance speaker, inasmuch as the high impedance means high voltage-low current and the low impedance means low voltage-high current, it is obvious that if we interpose a transformer, it will step the high voltage-

(Please turn to page 50)

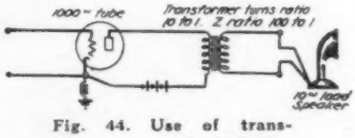


Fig. 44. Use of transformer to match 1000 ohm tube to 10 ohm loudspeaker

Fine Production Records

...Fine Communication!

American industry can feel proud of its record. It has swung into full wartime production almost overnight, and is now outproducing all Axis nations combined. At this terrific pace, the war's outcome can't long be in doubt.

In this nation-wide effort telephone, exchanges constitute the "nerve centers." Their unfailing performance under the heaviest traffic of all history and the ingenuity of telephone men in keeping lines working, have been vital factors in attaining top production.

In spite of shortages, our "telephone front" has been kept at high efficiency by the splendid cooperation of everyone in the business. Now we must all put forth even greater efforts to insure complete and final victory in the shortest possible time.

Here at Automatic Electric the service of our technical consultants are available at all times to aid you in matters of maintenance, engineering, transmission, construction, and other wartime problems. Feel free to call on us—we're ready to help in every way we can.

AUTOMATIC ELECTRIC

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EDITED BY J. S. REED JR.

Line AND Desk

Q. We are experiencing trouble with inductive interference in our metallic lines which parallel electric charged fences. What can be done to prevent such trouble? We have tried connecting small condensers between the fence charger and ground with only fair results.

A. We know of no successful means of eliminating such interference at the fence charger itself. Such charges have inherently bad wave form and generate harmonics falling in the middle of the voice range that cause severe interference. Transpositions of your metallic lines where they are paralleled by the electrified fences should eliminate all noise. We assume that you have only one or two circuits. If this is the case, transpositions placed at the quarter and three-quarter section points in each parallel in one circuit and at the half-section point in the other circuit should produce complete relief and maintain the crosstalk balance of the circuits at the same time.

Q. What simple method would you suggest for testing transmitters?

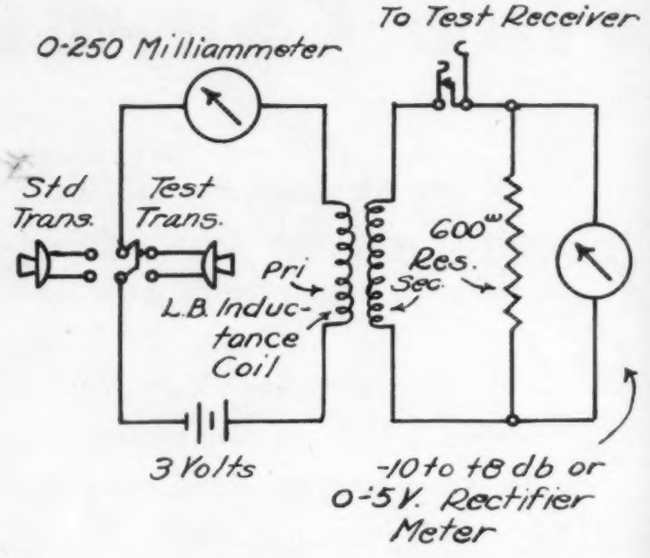


Figure 1—Circuit of transmission testing unit.

A. The circuit shown in Figure 1 will satisfactorily test transmitters for the two most important characteristics—transmission and noise. A copper oxide rectifier meter of 0-5 volts or a decibel meter of about plus 8 to minus 11 db range (.006 watt zero reference level and 600ᵂ load impedance) is utilized. If the 0-5 volt copper-oxide rectifier meter is the only available unit, it may be easily calibrated to read in decibels by means of the following table.

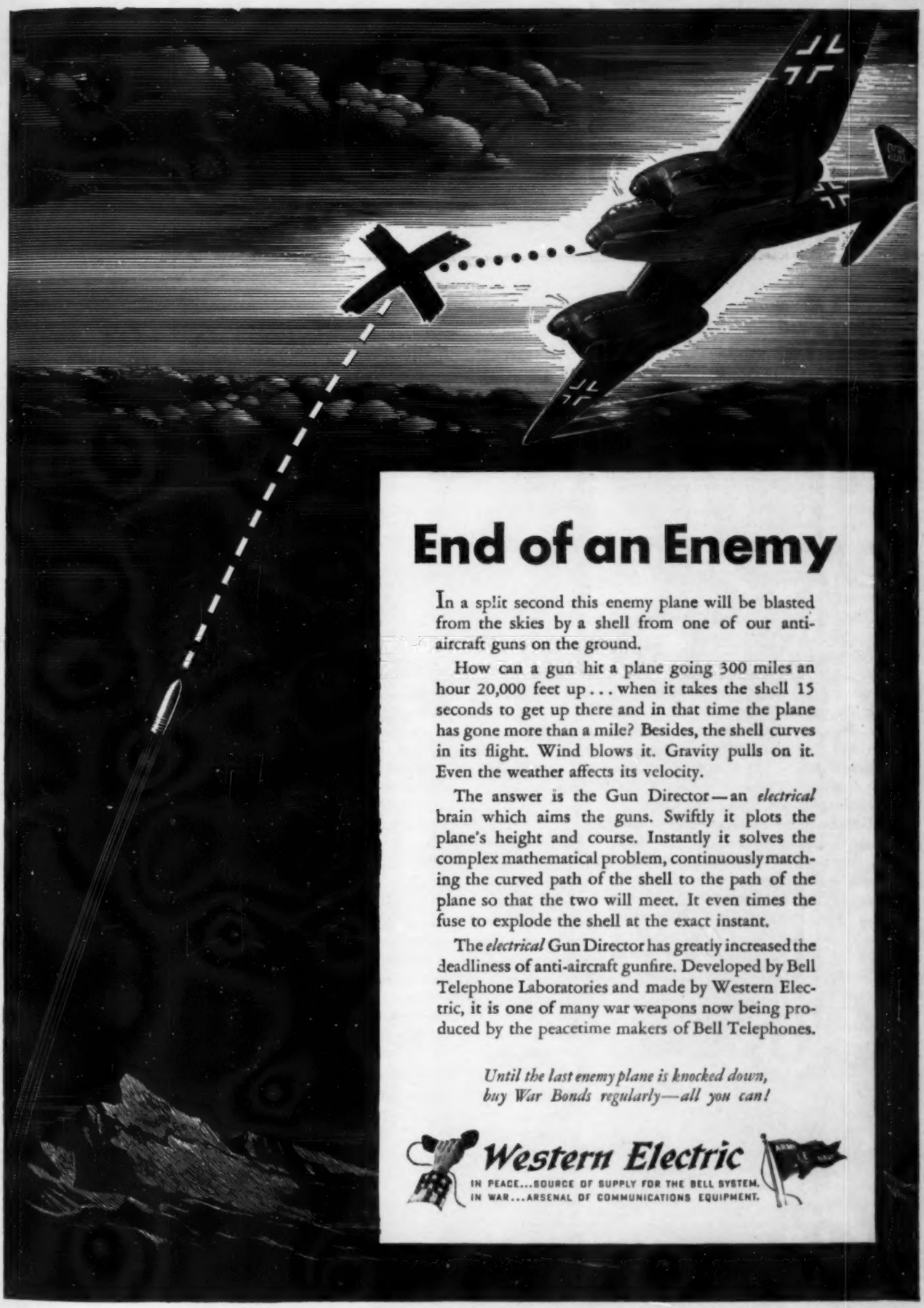
Power level db	Volts — .006 watt at 0 db in 600ᵂ load
—10	.6000
— 9	.6732
— 8	.7554
— 7	.8475
— 6	.9509
— 5	1.0670
— 4	1.1972
— 3	1.3433
— 2	1.5071
— 1	1.6910
0	1.8794
+ 1	2.1289
+ 2	2.3886
+ 3	2.6801
+ 4	3.0071
+ 5	3.3741
+ 6	3.7867
+ 7	4.2477
+ 8	4.7660

A good test word to use for the transmission comparison is "retribution". Repeat this word at an uniform voice level while throwing the switch from test to standard alternately. The difference in meter needle deflection for each transmitter should not exceed 5 decibels. The standard transmitter may be one known to have good transmission quality is determined by actual talking tests.

Noise tests are made by listening for frying sounds in the receiver when the transmitter under test is connected in the circuit.

Q. How is it possible to distinguish between Northern White Cedar and Western Red Cedar poles?

A. Northern White Cedar has numerous protruding knots, is somewhat crooked, and has more taper than Western Red Cedar, while the latter is straight and smooth with very little taper from the bottom to the top.



End of an Enemy

In a split second this enemy plane will be blasted from the skies by a shell from one of our anti-aircraft guns on the ground.

How can a gun hit a plane going 300 miles an hour 20,000 feet up . . . when it takes the shell 15 seconds to get up there and in that time the plane has gone more than a mile? Besides, the shell curves in its flight. Wind blows it. Gravity pulls on it. Even the weather affects its velocity.

The answer is the Gun Director—an *electrical* brain which aims the guns. Swiftly it plots the plane's height and course. Instantly it solves the complex mathematical problem, continuously matching the curved path of the shell to the path of the plane so that the two will meet. It even times the fuse to explode the shell at the exact instant.

The *electrical* Gun Director has greatly increased the deadliness of anti-aircraft gunfire. Developed by Bell Telephone Laboratories and made by Western Electric, it is one of many war weapons now being produced by the peacetime makers of Bell Telephones.

Until the last enemy plane is knocked down,
buy War Bonds regularly—all you can!

Western Electric

IN PEACE...SOURCE OF SUPPLY FOR THE BELL SYSTEM.
IN WAR...ARSENAL OF COMMUNICATIONS EQUIPMENT.

Highlights of the Communications News

(Continued from page 27)

equipment in its systems than the United States, there is a considered judgment among government experts that the telephone manufacturing plants in the British Isles, and on the Continent should be used for supplying the permanent equipment in the restoration of the European telephone systems. The affiliates of the I. T. & T. and Automatic Electric would be the key suppliers under this situation. Their German competitor, the Siemens-Halske main plants near Berlin have been most seriously damaged, if not practically destroyed, by the bombing raids. Siemens, despite a recent published report, was not the principal supplier of telephone equipment in Europe and, in fact, is known to have furnished only around 65% of the telephone facilities in the Reich itself before the war and engaged in some exporting to adjacent countries, although by no means as the major supplier to those areas, and minor shipments to Latin America.

Therefore, it is felt that the reported destruction of the Siemens plants would not in any way hamper restoration of European telephone systems because of the excellent capacity of the I. T. & T. affiliated plants in England and on the Continent and of the Automatic Electric affiliated factories at Liverpool, and in Belgium and Italy. The latter premise is predicated upon the thought that these plants on the Continent may come through the warfare without serious injury. The Federal Telephone and Radio plant, another I. T. & T. affiliate, at Newark, N. J., also could be used for this supplying but it is felt to be more important for Latin America.

Russia Big Customer

BECAUSE the bulk of the fighting in Europe has been in Russia, the Soviet will probably need the major requirements for restoration of communications facilities. In Russia, because there is hardly any substantial communications manufacturing, that national may well become the biggest customer of the American telephone manufacturing industry after the war, just as it is now the largest Lend-Lease user of communications equipment from the United States. An interesting development which has just occurred is that the Foreign Economic Administration has been given the assignment of the analysis of Lend-Lease projects in communications. The FEA, of course, will continue to pass upon the non-military requests for communications equipment exports.

Latin American Program

BESIDES the European survey, the FEA is now understood to be engaging in the preliminary preparation of a two-year program for the telephone and telegraphic systems in Latin America to be consummated when the war needs and critical materials situation are relaxed. The two-year program, which will cover the expansion of toll and local telephone services in the Latin American countries, is understood to include the operating properties, controlled or affiliated with the I. T. & T. and Automatic Electric and all other major operating companies in the Southern hemisphere and Caribbean area. Both these American companies are cooperating to the fullest degree with the government agencies in the formulation of this program and, of course, the International Standard Electric Corp. plants at Newark, N. J. and in Brazil will be key suppliers for this project.

Reconversion Discussions

UNDER the new policy of the War Production Board, promulgated by Chairman Donald M. Nelson, to assure industry that it will have a considerable voice in reconversion, the Telephone Operating and Manufacturing Industry Advisory Committees to the WPB Communications Division were understood to have considered this subject and its problems in a concentrated way at their meetings Feb. 10 and 11, respectively. The two advisory groups had previously studied reconversion matters informally at their sessions.

The most important phase of the new regulations of the WPB to give industry committees authority to consider reconversion planning is that it will free these committees from penalty under the Anti-Trust laws by placing such work within the scope of the Second War Powers Act. The new regulations specify that no conversion order can be issued without prior consultation by the WPB with an industry committee. Dissenting minority groups in these committees also can appeal to the top WPB leadership. No WPB official can now attend "rump" sessions of industries, but all matters under consideration must flow through the advisory committees.

END

Minnesota Convention Report

(Continued from page 30)

scribers about 17,000 to regain their loss of 20% caused by the same depression. It was his opinion that rural stations could be increased by improving service.

Mr. Fancher, St. Paul, had as his subject "Some Experiences" and outlined the activities and experiences he had while serving as supervisor of telephone for the Minnesota commission. He explained that he and Mr. Crowley in their travels over the state found many companies operating under misconceptions in various capacities. He stated that the commission is anxious to aid all of the telephone operating companies needing assistance but that it was up to the company to take the initiative.

Mr. Fanches has been in the telephone business since a schoolboy when he was the night operator at Winnebago, Minn. Later he was connected with several companies operating in Minnesota in an engineering capacity until he accepted a position with the Minnesota commission in 1929 to investigate the rates of the company in St. Paul. He was named to his present position in 1932.

The Open Forum session of the Minnesota association is noted for its effectiveness in airing out all subjects. Under the leadership of Mr. Crowley the 1944 Open Forum was no exception. He outlined several plans that operating companies might use in cooperating with switched subscribers whereby better service and maintenance might be obtained. He also gave in descriptive detail the results of many of his travels throughout the state and the problems that were encountered and solved. The door was open to all questions.

Minnesota Exchange Sold

The Terrace Telephone Company of Chippewa Falls, Minnesota has been authorized to sell and transfer all of their telephone properties to the Terrace Cooperative Telephones Association, a corporation. The order was issued as of January 19.

General Harrison Addresses Western Society of Engineers

Major General W. H. Harrison, chief of the Signal Corps Procurement and Distribution Service, Washington, D. C., and former vice president and chief engineer of the American Telephone and Telegraph Company, will speak on War and Signal Supply before the Western Society of Engineers February 15, at Chicago.

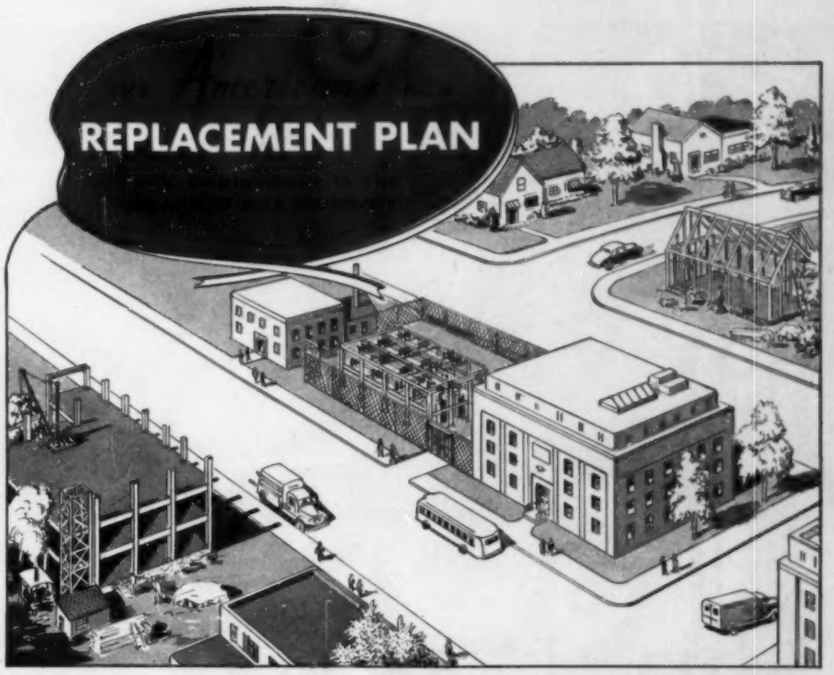
Major General W. H. Harrison

He will give the Army's view of the necessity of supplying our fighting forces with radio-electronic and other signal equipment. Even with the 80% increase in production of Signal Corps equipment in the past six months, 1944 demands will be approximately 30% greater than for 1943. The radio-electronic industry has not had and does not anticipate, any reduction in production such as that taking place in other fields of military supplies.

General Harrison has served with the former Office of Production Management and with the War Production Board before entering the Army in June 1942 with the rank of colonel. Later, as brigadier general, he became director of Procurement for the Army Service Forces and July 1, 1943, was appointed to his present post.

$6 Billion Business

More than six billion dollars is the total investment represented by the plant and equipment of the many thousands of telephone companies in the United States, which provide a nationwide inter-connecting service for about 26 million telephones.



The Above Represents A Post War Period Scene in Your Community, Will You Have the Equipment to Service the Communication, Light and Power Requirements?

THE AMERICAN COACH REPLACEMENT PLAN IS THE ANSWER

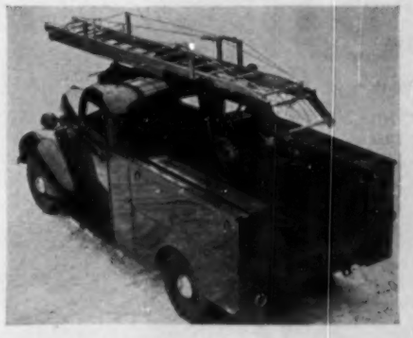
Today, practically all utilities find their automotive equipment considerably depleted. And it's reasonable, for they have had to keep, at tops, all services, and have had to do this with limited, practically irreplaceable equipment.

It is predicted that at least 20% of all utility trucks will have to be replaced within 12 months after "V" Day and that many additional new trucks and much new equipment will be needed to cope successfully with the construction of the many miles of new power and communication lines required to service the thousands of new homes envisioned for the post-war period.

A large number of these trucks will need utility bodies and mechanical equipment such as is furnished by "American Coach."

Desiring to cooperate to the fullest with the Utilities and deliver the utmost in service, "American Coach," after a thorough field investigation and careful analysis has worked out a plan that will speed up, for the Utilities, the delivery of post-war equipment.

Let us send you full details regarding THE AMERICAN COACH REPLACEMENT PLAN. Write, Wire or Phone for it today.



THE American COACH & BODY CO.

PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

Bradding wire around cable.

Friction tape is put over rubber tape.

Underwater Telephone Line

Unwilling to wait for the arrival of regular submarine telephone wire during the desperate fighting for Munda in July of last year, a Signal Corps detachment laid an underwater telephone line from Corps headquarters on Rendova Island to two divisions on the mainland with Spiral 4 cable. This cable is made to be used on land. This marked the first time its use for underwater communications has been reported.

Spiral 4 cable ordinarily is used by Signal men to establish semi-permanent wire channels to the front lines. It is utilized with carrier equipment and furnishes a number of voice and telegraph circuits to division and regimental command posts. It was used with great success in the North African and Sicilian campaigns and is playing its part in furnishing vital communications to the troops now fighting in Italy.

The story of its utilization as submarine wire was brought back to this country by Col. Francis L. Ankenbrandt, Signal Officer of U. S. Army forces in the South Pacific Theatre of Operations. Col. Ankenbrandt described the operations as follows:

"The job of getting wire communications to the two divisions on Munda was one of the outstanding feats I witnessed during the year and a half I have been in that theater. The nine-mile route was half jungle and half ocean. Part of the time, the working party, led by Major George. A Reeves of Oklahoma City, Oklahoma, was under heavy fire from Jap artillery emplaced in the hills, strafing attacks by Jap aircraft and snipers along the shore of the mainland.

"When we learned that Corps wanted that line through, we organized a construction section of 50 men from an operations company and a construction battalion. The route ran through 1¼ miles of muddy plantation; 2.2 miles of ocean, with a depth of 1,700 feet; 2.4 miles of almost impassable jungle; another 2.2 miles of ocean and 1 mile through tangled jungle on the mainland.

"The ocean laying part of the job was the most interesting from a technical angle. Much care was given the sealing of connectors to assure maximum waterproofing. Rubber tape and friction tape was used, since it was the only material

Male and female sockets together.

Closeup of cable being brought together and loaded on Higgins boat.

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Higgins boat.

available. The cable was looped at each of the connectors to relieve the strain, and the cable was laid in a landing boat in figure 8 loops.

"Paying out the cable over the first water route was completed in one hour and forty-five minutes. Nothing unusual was encountered except that extreme care had to be taken so as not to bruise the cable or shear the connections on the coral. The cable was laid out generously and reached a floating level at an estimated depth of between 25 and 50 feet. Barbed wire stakes were used as anchors and were placed at every one-eighth mile.

"Field wire was used to link the two submarine circuits at Roviana Island, in the middle of the channel of water. Wire had to be carried from boats to shore over sharp coral from 50 to 100 feet and further. The men wore out new shoes in a single day doing this. At about the center of the island, the boats were so far from shore they were fired on by Jap snipers located on the mainland.

"Out of the four circuits obtained, three were still in operation when I left in November. One circuit had gone out about 30 days after the installation."

Communication on all the islands in the South Pacific Area, which is under the command of Admiral William F. Halsey, is by wire, Col. Ankenbrandt pointed out. Interisland communication is by radio. Both perform very well.

On the islands, telephone systems have been installed by the Signal Corps. Commercial switchboards that vary in size from 1 to 10 positions are used. This follows the general practice of substituting commercial equipment for tactical equipment after combat operations are over in each area.

Various fixed radio transmitters and receivers link New Caledonia, theater headquarters, with the various island commands—Guadalcanal, Samoa, Bora-Bora, Bougainville, etc. There is also a radio circuit to Australia.

Minnesota Commission Approves Two Sales

Orders issued February 2 by the Railroad and Warehouse Commission of the State of Minnesota approves sale of two companies operating in that state. The Felton, (Minn.) Rural Telephone Company, a corporation, sold to Ansgar J. Borgen, an individual, all the physical telephone company properties of that Company.

In another order issued the same day the joint application of the Dead Lake Rush Lake Telephone Company, as seller, and the Dent Star Lake Telephone Company, a corporation, as purchaser whereby all the telephone properties of the former company was sold.

Rayborn Made Major

The promotion of Richard T. Rayborn, Signal Officer of AAF Redistribution Station No. 1, from captain to major was announced recently.

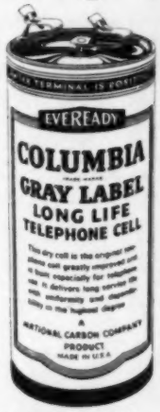
Major Rayborn, whose home is at 1600 Monroe St., Paducah, Ky., has been stationed in Atlantic City for more than a year, originally serving as Signal Officer for the Basic Training Center there and then transferring to the same assignment for the Station at the time it was established.

In civilian life, the major was general outside plant engineer for the Illinois Commercial Telephone Co., a position to which he rose after starting at the bottom as a cable splicer's helper and going up through all branches of the organization.

Major Rayborn served overseas in the last war with the 11th Engineers, taking part in six major engagements: the Somme Defensive, Lys, Aisne-Marne, St. Mihiel, Meuse-Argonne, and the Defensive Sector.

He is from the fourth generation of his family to hold an officer's commission, but began his military career in the first World War as a private, rising to acting sergeant. Maj. Rayborn received his commission in July, 1942 at Ft. Monmouth, N. J.

Long Life Telephone DRY CELLS



The quality cell preferred by telephone engineers.

"Eveready"
"Columbia"
"Gray Label"

Developed in America's largest dry battery laboratory, this Cell is designed to give both ***longer life*** and ***higher sustained voltage.***

Engineered to one standard of superior quality by specialists in battery manufacture.

Made by the makers of "Eveready" "Air Cell" Operators' Transmitter Batteries.

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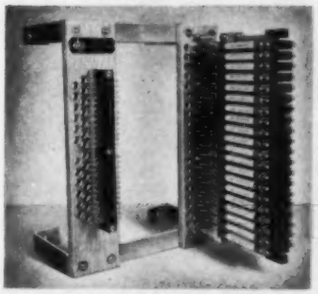

The COOK L9 WALL DISTRIBUTING FRAME

The Type L9 Wall Distributing Frame is intended for economical distribution and protection of limited capacity cable, and especially for installation in small exchanges. The L9 Wall Distributing Frame, made in 20, 40, 60, 80, and 100 pair sizes is designed to carry any Cook central office protector.

The frame of the L9 consists of two pieces of hard kiln-dried maple, one drilled and arranged for, and equipped with, line terminals; the other drilled and milled for mounting the protectors; and two heavy mounting brackets of bar iron finished in durable paint.

DISTRIBUTED BY

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War Production Board Issues Surplus Catalog

A revised tabulation, superseding that issued September 23, 1943 covering surplus stocks offered for sale by telephone operators, was issued January 18 by the Communications Division of the War Production Board.

The 26 page catalog is divided into four sections. These are: (1) wire, (2) cable, (3) composite cable and (4) miscellaneous outside plant equipment.

The miscellaneous outside equipment section of the book mentions that some telephone operators have indicated a surplus of items of outside plant equipment (such as cable rings, cable terminals etc.) and as it was impracticable to list such items. Information regarding companies having such materials for sale may be obtained from the Communications Division of the War Production Board.

Leighton H. Peebles, director of the Communications Division of the WPB, was one of the principal speakers at the recent Minnesota convention. A condensation of his address was carried in the February issue of Fortnightly TELEPHONE ENGINEER. His address could be considered a report to the telephone industry by the Communications branch as he covered almost all phases of the Board's operations and what might be expected in its future operations.

Hubbell Named President Of Telephone Pioneers

President James W. Hubbell of the New York Telephone Co. was recently elected president of the Telephone Pioneers of America for this year, succeeding president A. H. Mellinger of the Illinois Bell Telephone Co. H. E. Smith of the New Jersey Bell was named senior vice-president of the Pioneers during 1944.

Five new vice-presidents were selected through a mail ballot, including Olive E. Geach of the Bell of Canada; C. E. Garrett of Mountain States; W. F. Armstrong, Assistant to the President of Cincinnati and Suburban Bell; J. D. McManus of Southern Bell; and E. M. Foley, Jr. of Southern New England.

Eaby Named President of Pennsylvania Association

At the organization meeting of the Pennsylvania Independent Telephone Association held in Harrisburg January 13, C. E. Eaby, vice president and general manager of the Denver & Ephrata (Penn.) Telephone and Telegraph Company, was named president to succeed A. O. Black, directing head of the Peoples Telephone Corporation of Butler, Pa.

C. E. Eaby

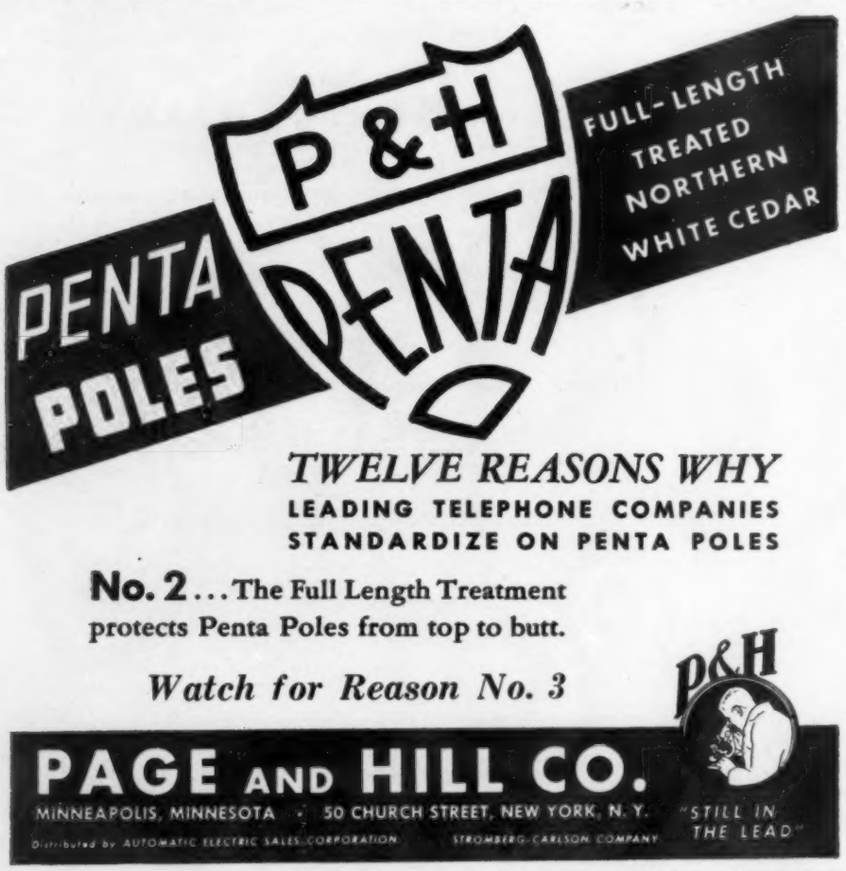
Lloyd C. Wright, president of the Meadville (Pa.) Telephone Company was re-elected vice president. Mr. L. R. Thurston, president of the United Telephone Company of Pennsylvania, Harrisburg, succeeded Mr. Eaby as vice president. Treasurer G. B. Rudy Jr., York, and executive secretary H. M. Stewart and secretary, M. E. Cunningham, were all re-elected.

The new president, besides his activity with the telephone company, is very active in civic affairs in his section of Pennsylvania.

President's Highway Program May Mean More Poles to Move

According to a recent USITA bulletin the Association is calling the industry's attention to President Rosevelt's proposal to spend $750,000,000 annually on the improvement of urban and rural highways which may, if carried out, mean some headaches for telephone companies.

The desirability of locating all pole lines, rebuilt or constructed new, inside the property lines under easements obtained from property owners



is emphasized by the proposed road program. The difficulty of obtaining easements is offset by the obvious advantage of being able to "pick up" and move pole leads back to some new property line with federal, state, or county expense reimbursement.

Butler Joins Telephone Services, Inc.

L. W. Butler, formerly general superintendent of the Keystone Telephone System of Philadelphia, Pennsylvania, has recently become associated with Telephone Services, Inc. of Fort Wayne, Indiana, the service organization of Telephone Bond and Share Company.

Mr. Butler has had a wide experience in the telephone industry, having been with the Automatic Electric Company for eleven years, five of which were spent abroad immediately prior to and during the early part of World War I. Mr. Butler returned to this country to enlist and is a veteran of the first World War. In 1921 he joined the Keystone Telephone System of Philadelphia and shortly thereafter was made superintendent of equipment and maintenance. In 1940 Mr. Butler was advanced to the position of general superintendent of that Company and occupied this position until the time he joined the Telephone Services, Inc. organization.

Associated Telephone Company, Ltd. Installing Automatic Ticketer

A new feature in telephone service, an automatic toll ticketing system, soon will be placed in operation on a limited basis in the Santa Monica California exchange, according to C. F. Mason, president of Associated Limited. The new system will enable a customer connected with the ticketing equipment to complete toll calls into nearby exchanges without the assistance of a toll operator.

Upon completion of a conversation established by means of the new equipment, a toll ticket automatically will be produced showing the date and time of day of the call, the calling subscriber's number and his class of service, the exchange and number of the called station, the elapsed conversation time and the charge for the call computed on the basis of the class of service, rate and conversation time.

The ticket printer is similar to the familiar typewriter unit. The printer need not be installed in the office in which the call originates but may be located in an accounting center or other convenient office, even though remotely situated.

The automatic ticketing equipment is not confined to the use of individual line subscribers but is designed for the use of four party line subscribers as well, if desired.

One of the first installations of its kind in the United States, the Santa Monica ticketer was developed by the Automatic Electric Company of Chicago. The equipment, designed primarily for large metropolitan areas, will be described in greater detail at a later date.

Pacific Telephone Co. Cuts Intrastate Toll Rates

After negotiations with the California Railroad Commission, the Pacific Telephone & Telegraph Co. and the Southern California Telephone Co. announced Feb. 2 that they had agreed to a reduction of intrastate toll telephone mes-

RAYTHEON RECTICHARGER

RectiChargeR & Batteries = Automatic AC—DC Telephone Power System

RECTICHARGERS PREVENT

- Power Failures
- Voltage Variations
- Overcharge and Undercharge
- Poor Ringing
- Short Lamp Life
- Sticking Relays

NO MOVING PARTS *mean* NO WEARING PARTS

RectiChargeRs increase battery life up to 40%

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COPPERWELD SPINNING WIRE

For Spinning Cable Supported By Copper Strand Is Available NOW

Mfd. by Cable Spinning Equipment Co.

Write for Your Copy of "Spinning in the Jungles of Trinidad".

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You'll Enjoy

being one of our

PRINTING CUSTOMERS

•

For years hundreds of telephone men have found a great satisfaction in buying their printed supplies from Suttle—have learned that they can depend on us for the forms they need.

Here's Why

1. We know the telephone business and understand your requirements.
2. We have the proper equipment to do your jobs promptly and efficiently.
3. We do our level best to see that our customers are thoroughly satisfied.

The result is a telephone man gets more for his money when he buys printing from Suttle.

You start to enjoy the advantages of being a Suttle printing customer from your very first order. Try it the next time you need printing.

DEPEND ON SUTTLE

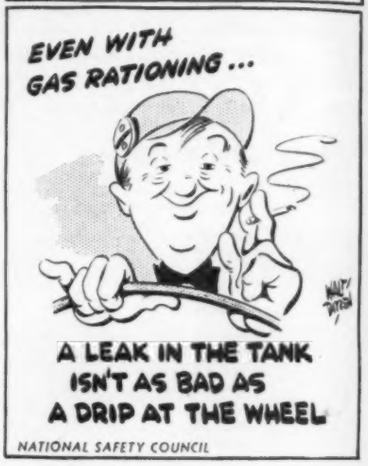
sage rates amounting to $3,803,000 a year.

N. R. Powley, president of the Pacific Telephone & Telegraph Co., said the reductions had been agreed to so that the company might give its undivided attention to the war effort, and "avoid highly technical, expensive and prolonged formal proceedings and possible extended litigation." However, Mr. Powley emphasized that "rapidly rising costs, particularly taxes and wages, clearly indicate the necessity of arresting the downward trend in our telephone rates."

Earl Grimm Now An Air Corps Instructor

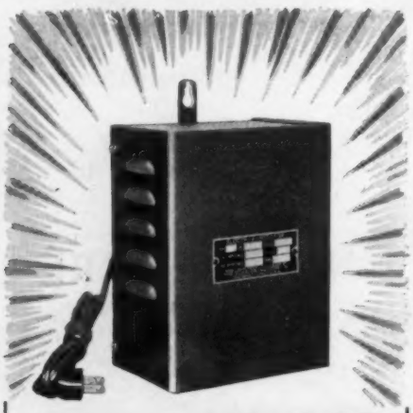
Telephone folks in Iowa have good reason to be proud of Earl Grimm, former Kellogg Switchboard and Supply Company representative in that state.

DON'T BE AN ACCIDENTEE!



Earl, like his friend Jim Trevillion who also represents Kellogg "where the tall corn grows," has long been an aviation enthusiast. His interest in flying inspired him to make a thorough study of that subject and with the declaration of war found him a completely proficient pilot, well equipped to train others for that suddenly all-important profession.

Today, Earl is devoting his full time to instructing Army Corps cadet pilots in the art of flying winged destroyers of Axis tranquility. Needless to say, as when he served Kellogg's Iowa customers, he is doing an excellent job.



ELECTROX BATTERY ELIMINATOR

GIVES WORRY-FREE SERVICE

Operates direct from lighting circuit. Delivers constant, humless D.C. to operator's circuit on magneto switchboard. Power-off relay assures uninterrupted service in case of power failure. Low in cost! See your jobber, or write direct for full information.

SCHAUER MACHINE COMPANY

2059 READING RD., CINCINNATI 2, OHIO

Need Tools? Telephone Employees Can Get Them---Here's How

New regulations have been established by the WPB which provide that telephone company employees may use their employer's MRO preference ratings to purchase hand tools and safety equipment. The procedure to be followed is simple. An employee merely applies his employer's preference rating and attaches a simple certification to the purchase order. The certification must be signed by the employer and should read as follows:

. . . . MRO. The following item . . . .

"Preference rating (specify rating) (only one may be placed on each certifcate; specify type and size of tool, or give name of other item) is required by the undersigned employee for use only in the undersigned employer's business, and the undersigned employer requires the employee to furnish the item. The undersigned employee further certifies that he does not even own or possess any similar item which will serve the same purpose.

_____

Name and Address of Employer

_____

Authorized Signature

_____

Signature of Employee

_____

Position"

It should be noted that employer's preference rating may be used by employees **only** to purchase tools and equipment needed for use exclsively in the employer's business.

Amended Orders Analyzed

(Continued from page 32)

cooperative or mutually owned telephone systems, and persons owning either a telephone or a telephone system which is connected to a telephone system rendering service to the public. These classifications were previously considered as operators but were not specifically mentioned.

Persons or companies permitted to operate under an MRO order other than order U-3 may not be considered as operators under the new definition.

Persons engaged in the operation of **private** telephone communication systems and under a specific directive of the War Production Board, may use the preference rating and allotment number granted by Order U-3.

As far as the average telephone company is concerned the expanded definition is of but little interest.

Restrictions on Use of Material

(c) (1) (ii)—That provision in the order which provided that material obtained with the preference ratings or MRO symbol authorized by Order U-3 could not be used for toll line plant operating supplies in any single case in which the total material cost exceeded $500, has been **revoked.**

In effect this means that operating supplies obtained under U-3 can now be used for toll line plant up to $2500 of rated material or $5000 total material without authority to begin construction.

(c) (2) (v)—This is a new provision which states that material obtained under Order U-3 may be used by the operator on any construction project approved by the War Production Board on form WPB 2774 or any alternative form.

However, material so used may only be replaced in inventory by use of the preference rating or allotment number authorized on form WPB 2774 or alternative form.

This latter restriction is intended to prevent operators from replacing material obtained under the blanket ratings granted by Order U-3 and used on a construction project approved under a WPB-2774 application, except where the replacement material is obtained by the ratings granted under WPB-2774.

(c) (3)—An important change from the standpoint of the smaller operators is the raising of the ceiling on materials obtainable in any single case for use as operating supplies from $500 to $2500.

In the former order, an operator whose inventory at the end of 1942, or whose use during 1942 did not exceed $10,000 was restricted to the $500 ceiling for any single case.

The provision as now written still requires that individuals or companies defined as "operators" **but who do not furnish telephone service to the public** and who operate under a WPB directive, must still conform to the $500 ceiling if their inventory and use during 1942 did not exceed the $10,000 limit.

Restrictions on Inventory

(c) (3)—This is a new provision of the order which provides that no operator shall replace in inventory by use of the preference rating or allotment number of Order U-3 any material withdrawn for the purpose of making an exchange central office addition under paragraph (g) (4) of Order U-2.

Paragraph (g) (4) permits such C.O.E. additions when 75% or more (in cost) of the material required for an addition can be obtained from the operator's plant or operator's stocks. This provision merely implements the new paragraph (g) (4) of U-2 which specifically states that the material taken from an operator's plant or stocks pursuant to the paragraph shall not be replaced.

(end of Bulletin No. 10)

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Send in Your Problems o

The Spring
Maintenance and
TELEPHONE ENGINEER

will publish

LINE & DESK

One of the most popular features of TELEPHONE ENGINEER & MANAGEMENT has for years been its Line & Desk columns. Composed of questions and answers from our readers, it is more popular than ever during war times when so many key operating men have answered the call to colors . . . and others are filling in at positions that are not entirely familiar to them.

Our entire staff of editors and contributing editors cordially invite telephone men to make use of this department at all times. There is no charge whatever . . . it is FREE . . . simply a service of TELEPHONE ENGINEER & MANAGEMENT.

With Maintenance & Construction being on an entirely different basis than during peace times, the problems of our readers today will be interesting and the answers valuable to many facing the same situations. Send in your problems . . . our editors will welcome them . . . and you'll see same printed and answered in the SPRING, April 15, MAINTENANCE & CONSTRUCTION issue of TELEPHONE ENGINEER & MANAGEMENT.

OTHER EDITORIAL FEATURES

In addition to the many questions and answers o Maintenance and Construction to be published in th LINE & DESK columns plus a number of specia ized shorts, the following featured articles, prop erly illustrated, will be contained in the SPRING, Ap 15, MAINTENANCE & CONSTRUCTION issue o TELEPHONE ENGINEER & MANAGEMENT.

MAINTENANCE & CONSTRUCTION For WAR TIM PRACTICE—By - - - - J. S. Reed, J

OUTSIDE CONSTRUCTION By - - - - - - - - - - G. S. Gi

PLANT MANAGEMENT PRACTICES By - - - - - - Jay G. Mitche

ELECTRICAL FUNDAMENTALS Continuation of Short Cours

Maintenance and Construction

April 15,

Construction issue of

and MANAGEMENT

the Answers

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Electrical Fundamentals For the Telephone Man

(Continued from page 34)

low current down to a voltage-high current condition which will make the source (vacuum tube) and load (loudspeaker) function very efficiently. This is illustrated in Figure 44.

Leakage Reactance Of Transformers

ON commercial transformers the primary and secondary windings are not placed on separate legs of the transformer core as was shown in the elementary transformer of Figure 36, but instead the windings are placed on the same core by splitting the windings into two or more separate coils which are connected in series. One method of accomplishing this result is to make the windings cylindrical in form and each leg of the core carries a portion of both the primary and secondary windings. Another method consists of using a number of flat pancake type coils which are stacked over the core so that the primary and secondary coils alternate or interleave together.

Primary and secondary windings should be interleaved together to insure that all of the flux of the primary cuts through all of the turns of the secondary. If the transformer is poorly made in this respect, it will have high **leakage reactance** which means that its voltage regulation will be poor. A transformer with high leakage reactance will act as if both primary and secondary contains a series reactance.

Induction Coil Transformer

ALTHOUGH the transformer is essentially an alternating current device, it is occasionaly used in connection with direct current, in order to change a low voltage direct current (as, for example, a storage battery source) to high voltage alternating current. A good example of this is the early type Ford coils equipped with vibrators and so arranged that the interruption of direct current flowing in the primary winding of the induction coil by the vibrator switch would induce a high voltage in the secondary winding, which consisted of many thousands of turns of fine wire. Thus a six volt battery could be stepped up to 10,000 volts which was sufficient to jump across the gap in a spark plug.

The reason for using what might be termed an open core rather than a closed core is the necessity for a quick collapse of the lines of force when

EXAMINATION NO. 9

Transformers

1—Explain the simple theory of a transformer.

2—If we impress 10 volts on the primary of a transformer whose turns ratio is 1 to 20 voltage will be available on the secondary?

3—If the current in the primary of a transformer whose turns ratio is 1 to 10, is 5 amperes, how much current is flowing in the secondary?

4—Assume we have 10,000 ohm load which we wish to match to a 50 ohm source what should be the impedance ratio of the necessary matching transformer?

5—What should be the turns ratio of the transformer in problem 4?

6—Why must the power capacity of a transformer be taken into account in the application of transformers?

7—What is the principal difference between transformers used for 60 cycle power purposes and those used in audio work?

8—Describe the theory of the vibrator type spark coil?

9—Why is a condenser shunted across the vibrator contacts of the spark coil?

10—Explain in terms of current and voltage why a load and source impedance should be matched.

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FUNDAMENTALS OF TELEPHONY

By ARTHUR LEMUEL ALBERT
Professor of Communication Engineering,
Oregon State College

374 pages, 5½ x 8½, 200 illustrations, $3.25

This book tells how and why telephone apparatus and lines operate as they do, covers the electrical theory and circuits with which every telephone worker should be familiar. It explains the phenomena of sound as they apply to telephony. It gives a practical knowledge of the functioning of transmitters, receivers, and other elements of telephone sets and systems, including modern manual and dial systems. It shows the requirements of local and toll transmission lines and how they are met, covering electrical measuring instruments, the measurements used in telephony, the problems of interference in telephone circuits, and other topics, in a clear, well-illustrated, elementary treatment, especially arranged for the non-engineering reader.

Check the data in these chapters

1. Direct-current Theory
2. Alternating-current Theory.
3. Electric Networks
4. Sound, Speech, and Hearing
5. Telephone Transmitters
6. Telephone Receivers
7. Telephone Sets
8. Manual Telephone Systems
9. Dial Telephone Systems
10. Transmission over Circuits with Distributed Constants
11. Transmission over Circuits with Lumped Constants
12. Measurements in Telephony.
13. Inductive Interference
14. Telephone Repeaters and Carrier Systems

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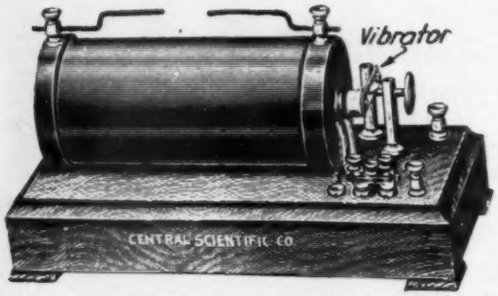

Fig. 46. Experimental type spark coil used in high school physics classes

the vibrator contact points pull open. The faster the collapse the higher the induced voltage in the secondary. Figure 45 shows the circuit of a spark coil.

Theory of the Spark Coil

LET us study the theory of the induction coil. Referring to the figure, the instant the battery switch is closed, current flows through the closed contacts of the vibrator, through the primary winding, and back through the battery. This flow of current attracts the armature of the vibrator and opens the contacts through which the current flows. When the contact opens, the high intensity magnetic field which has been developed in the core quickly collapses. In so doing, it "cuts' the secondary winding and induces a high voltage therein. The more rapid the cutting of the secondary winding, the greater the voltage induced, and it has been found that with the open core, the flux collapses much more rapidly than with the closed core.

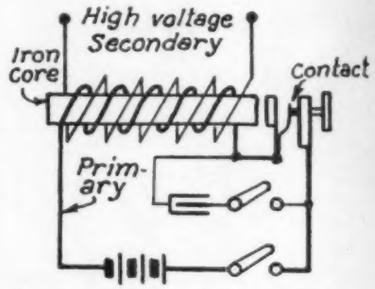

Fig. 45. Basic circuit of spark coil

An experimental type spark coil used in high school physics classes is shown in Figure 46.

Reason for Using Open Core Type

THIS type of transformer, or induction coil as it is often called, is much less efficient than the closed core type from the standpoint of transferred energy from the primary to the secondary; however, as used in automobile work it is not intended for power transfer purposes but rather merely for creating a high voltage spark. Therefore, it functions very satisfactorily for this purpose.

A small condenser is shunted across the contact point to absorb the tiny spark normally created across the points at the moment the vibrator spring opens, and which would result in severe pitting of the contact points if allowed to exist.

The induction coil type transformer is also used in telephone sets for the purpose of matching the transmitter impedance to the line.

(END OF LESSON IX)

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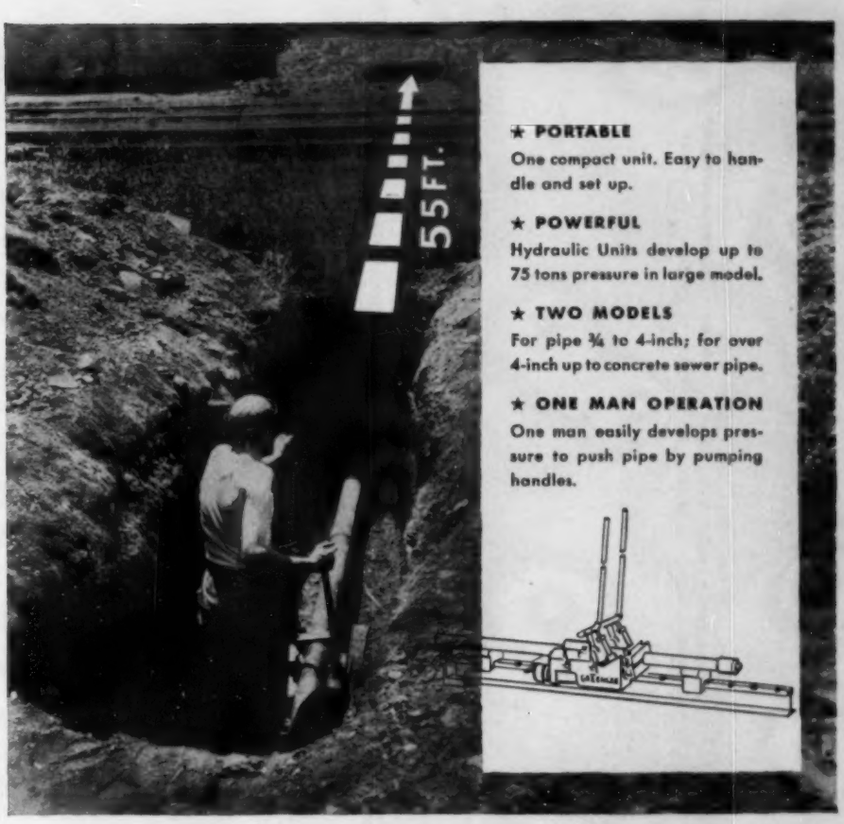
DeLoraine Made A Director Of International Tel. & Tel. Corp.

Edmond M. Deloraine, general director of the Laboratories Division of Federal Telephone and Radio Corporation, manufacturing affiliate of International Telephone and Telegraph Corporation, was elected a director at a meeting Feb. 2 of the I. T. & T. Board of Directors.

Mr. Deloraine, who has been closely associated with almost every research development of I. T. & T. since 1925, was born in Paris, France. Developing an interest in science at an early age, he received his first training in research in L'Ecole de Physique et Chimie, a branch of Paris University.

He came to this country in 1941 to take charge of the organization of the laboratories unit for Federal Telephone and Radio Corporation, and under his direction the laboratories have made outstanding technical advances. His administrative duties have not lessened his enthusiasm for personal contributions, and he continues his inventive activities, still filing many patent applications despite the demands of his position as head of a large organization.

Mr. Deloraine was made a Chevalier of the Legion of Honor in 1938 for exceptional services to the Post and Telegraph of France, and he was elected Vice President of the French Institute of Radio Engineers in 1939. He was a member of the International Consultative Committee of Long Distance Telephony since 1927. He is also a member of the French and Belgian Societies of Electricians, the French Astronomical Society, and, in this country, is a Fellow of the Institute of Radio Engineers.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Telephone Engineer

HANDBOOK TABLES

File—Pole Line Design
Date—February 15, 1944

Storm Loading Districts — Loading Factors

Storm Loading Map (Courtesy of Bureau of Standards)

Economical pole line design requires a knowledge of storm conditions under which types of pole lead construction will stand up. According to the storm loading map shown here, there are three general loading districts based upon the severity of storm conditions expected. These districts are classified as follows.

Heavy Loading District—In this area, the resultant loading is that due to the weight of the conductor and a layer of ice ½ inch in radial thickness combined with a transverse horizontal wind pressure of 8 pounds per square inch on the projected area of the ice covered conductor at a minimum temperature of 0° F.

Medium Loading District—In this area, the resultant loading is that due to the weight of the conductor and a layer of ice ¼ inch in radial thickness combined with a transverse horizontal wind pressure of 8 pounds per square foot on the projected area of the ice covered conductor at a minimum temperature of +15° F.

Light Loading District—In this area, the resultant loading is that due to the weight of the conductor and no ice layer combined with a transverse horizontal wind load of 12 pounds per square foot on the projected area of the conductor at a minimum temperature of +30° F.

William A. Hughes

W. A. Hughes Made V.P. & Gen. Mgr. of Indiana Bell

William A. Hughes, assistant vice-president of the American Telephone & Telegraph Company, Jan. 26 was elected vice-president and general manager and a member of the Board of Directors of the Indiana Bell Telephone Company. He succeeds Frank A. Montrose who is retiring.

Mr. Hughes, who has been with the Bell System since 1917 for the most part with the Southwestern Bell, had been assistant vice-president in the A. T. & T. personnel relations department under vice-president C. F. Craig since 1941. He is ranked as one of the ablest executives in the Bell System and in his personnel relations work during the past three years he has engaged in many important matters with the armed services. A graduate of the College of Emporia, Kansas, he served overseas in the first World War. On his return he was employed by the Southwestern Bell at Topeka, Kansas. He served in posts of increasing responsibility in the traffic department, including the positions of general toll traffic supervisor, general traffic supervisor and in 1937 became general traffic manager, being transferred five years later to the A. T. & T.

Lip Microphone

A midget microphone, worn on the upper lip, which eliminates outside noises and leaves the hands free, has been adopted for use by the Army Ground Forces and is now in production under the supervision of the Signal Corps, Army Service Forces.

Sustained in position by bands around the ears, the "lip mike" fits easily under gas masks and dust respirators and gives clear and intelligible reproduction with little distortion.

The microphone operates on a new noise-canceling principle and intensive tests under the supervision of the Armored Command have demonstrated that the instrument is capable of superior performance in high noise levels.

Designed particularly for use in tanks and under conditions where free use of the hands is advantageous, the "lip mike" is more rugged than similar apparatus commonly found in broadcasting stations or in commercial telephones. It can withstand total immersion for about ten minutes without injury to its mechanism.

To increase clearness in reproduction the microphone is provided with breath shields in front and back, acting as buffers against puffs of air from the mouth which would otherwise cause confused or unintelligible sounds. Outside noises enter at both sides of the microphone's diaphragm in equal volume while speech enters the opening nearest the mouth with much greater intensity than on the opposite sides. The frequency response is from 200 to 4000 cycles at normal altitude.

The microphone is supported by metal mounting brackets with two upstanding metal arms attached to loops of cord which fit over the users ears.

Both loops and bracket may be adjusted to bring the instrument directly opposite the lips of the wearer.

A midget combination—the lip microphone and the earphone headset recently adopted by the Signal Corps—now assures American soldiers of maximum protection and dependable performance.

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Personalities

W. E. Dunn has been named district manager of the Hazard, Ky., exchange of the Ashland Home Telephone Company

•

H. M. Lantz has been named president of the recently organized Mode (Ill.) Mutual Telephone Company which was organized to take over the lines of the Holland Township Telephone Company formerly operated by **Jacob E. Gallagher.** The Holland and Clarksburg townships have been without telephone service for the past few months.

•

Paul O. Dague, 47, auditor of the Junction City (Kan.) Telephone Company, died suddenly January 5.

•

Colonel Charles E. Saltzman, who is with the 5th Army in Italy, was awarded by King George last fortnight the Order of the British Empire, together with a dozen other high-ranking American officers. **Col. Saltzman,** the son of the late Chief Signal Officer **Major General Charles McK. Saltzman,** who had held that post from 1924-28, went overseas in March 1942, after having served as Assistant to the Chief Signal Officer and the Executive Control Branch Chief.

•

Mrs. Laura Henshaw is now manager of the Tipton, Oklahoma exchange of the Southwestern States Telephone Company. She succeeds **Miss Maudie Palmer.**

•

J. F. Williams, 82, for many years owner and operator of telephone properties at Marion and Old Fort, N. Car., died January 20.

•

Lt. Col. Joe L. Neyer, former engineer with the Southwestern Bell Telephone Company, commands the Pendleton, Ore., air field. He was a World War pilot and was recalled to service in 1941.

A. N. Fancher, Supervisor of Telephones, Minnesota Commission, presented one of the most interesting talks at the Minnesota Telephone Association Convention at Minneapolis recently.

•

A. D. Grote has been elected a vice president of the Illinois Bell Telephone Company. He will continue as general auditor of the company, a position which he has held for over seven years.

•

Richard E. Shover is the new manager of the Belton, Mo. exchange of the Western Light and Telephone Company.

•

Bruce McCurdy, former chief of the telephone section of the Communications Division WPB, has been acting as consulting engineer for Defense Communications Limited, a government owned company doing a very urgent communications job in Canada. This is in addition to operating his factory, the King Axe & Tool Co., Oakland, Me., which is now 100% in war production.

•

Floyd D. Ridings is now officially an assistant secretary-assistant treasurer of the United States Independent Telephone Association. It was made official January 17 by mail vote of the association's board of directors.

•

Herman L. Conter, 76, manager of the Citizens Telephone Company, Decatur, Ind., and prominent business and civic leader, died January 16 from a heart attack.

•

Joe Schmidt is the new owner and manager of the Noel (Mo.) Telephone Company which was purchased from **B. F. Garoutte.** The new owner is the son of **Edwin Schmidt** who owns the telephone exchange at Southwest City and at Sulphur Springs, Ark.

•

G. E. Kreiger, assistant general manager of the West Coast Telephone Company at Everett, Wash., is becoming quite a writer as evidenced by his monthly page in the company magazine "Crosstalk." He was also music director at the company's Christmas party.

•

Samuel A. Dunkel, 63, retired employee of the Illinois Telephone Co., at Jacksonville died January 18 from injuries caused by an automobile accident.

•

M. C. Atkins, district manager at Bryan, Tex., of the Southwest Telephone Company, has been re-elected president of the Bryan and Brazos County Chamber of Commerce. Texas governor **Coke Stevenson** was honor guest at the meeting for installation of new officers.

•

Harold Putnam has purchased the Prattsburg (N. Y.) Home Telephone Company from **Mrs. F. J. Wheelock.**

•

Miss Mary Vansandt, 75, for the past thirty-four years operator of the Anderson, (Mo.) Telephone Company died during January.

•

Mrs. Cassie Richardson has sold the Pope Mills Telephone Company of

Pope Mills, N. Y. with three stations to the Macomb Telephone Company, DePeyster, N. Y.

•

Charles C. Deering, secretary of the Iowa Independent Telephone Association, informs us their 1944 conventin at Des Moines will be held April 11 and 12 instead of the 10th and 11th.

•

H. M. (Milt) Stewart of the Pennsylvania Independent Telephone Association, has also notified us that the association he serves as executive secretary has changed their 1944 convention dates to Wednesday and Thursday, May 17 and 18. It will be held at the Berkshire Hotel at Reading.

•

John E. Fontaine has been made manager of Graybar's Beaumont Texas office succeeding the late **J. P. O'Neill** who died recently after 27 years of continuous service with the company.

•

M. R. Thompson, commercial manager of the Central Iowa Telephone Company, Toledo, Iowa, informed us at the recent Minnesota convention that he hoped to have every one of their sixty exchanges as readers of the Telephone trade journals. Several Iowans attended the convention, including **Major and Mrs. C. B. DeWitt.**

•

Paul H. Lyday, the new chief telephone engineer of the Central Electric and Telephone Company, Sioux Falls, So. Dak., was another out of state visitor at the Minnesota convention.

•

Mr. and Mrs. Claude Rex have sold the Stacyville (Minn.) telephone company to the Iowa Central Telephone Company of Cedar Rapids, Ia.

•

H. C. Roemer, W. H. Freng, Charles D. Hillis and **Francis White** have been named vice presidents of the International Telephone and Telegraph Corporation as of February 7. **F. F. Davis, H. H. Butner, G. A. Ogilvie and Leonard Jacob II** were named second vice presidents.

•

Jasper E. Poland, 47, manager of the Shelbyville, Illinois exchange of the Illinois Consolidated Telephone Company, died early in January. He has served the Independent telephone industry for twenty-five years.

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Telephone Traffic Definitions

By CONSTANT F.J. BOEHLEN
Traffic Engineer, Federal Telephone & Radio Corporation

1. Scope of the Article

ALTHOUGH several articles and books have been published dealing with telephone traffic calculations, little emphasis has been put on the fundamentals, i.e. the definitions of the traffic concepts and their units. Furthermore, the traffic terms, as well as their meaning, differ considerably as between different countries, organizations and individuals. This situation often leads to confusion and misinterpretation of traffic figures and statistics, even on the part of traffic engineers.

The following definitions will contribute toward clarifying the situation, and, it is felt that they may give telephone engineers, in general, and traffic engineers, in particular, a better foundation for traffic computations.

It is important to have a thorough understanding of the traffic concepts, since traffic figures are the basis on which the amount of telephone exchange equipment, trunk cables, toll lines, operators, etc., is computed. Thus traffic figures determine to a certain extent the economic engineering and operation of telephone networks and exchanges.

Telephone exchanges built for an overestimated projected traffic intensity yield poor returns on the capital investment. On the other hand, if the projected traffic is underestimated, the equipment will be soon overloaded and will require an extension within an uneconomically short period, because of duplication of work and also because of the possible disturbances which can be produced by installations of extensions to operating equipment. Such extensions often require an increased maintenance effort in the whole exchange, during installation and after the cut-over, and during this period a lower quality of service is not exceptional.

Correct traffic figures obtained by observation are valuable not only for forecasting traffics, but also to attain a maximum efficiency in existing equipment. The layout of the equipment assumes a uniform or determined distribution of the traffic which should be realized by adequate assignment of new subscribers or number changes. If this condition is not carefully watched, it will result in partial congestion of the equipment or partial loss of equipment facilities or both.

2. Definitions

A clear distinction should be made between the various traffic concepts as defined herinafter.

2-a Calls

A CALL is any engagement or seizure of a circuit, switch, or other traffic path. This applies whether the connection is established completely or not; i.e. the path is engaged as soon as it is made busy to other calls. Thus, false calls and test calls should also be considered as calls.

A "number of calls" is a pure figure. A number of calls does not refer to a definite time period during which these calls were effected or observed.

The unit symbol will be C (1 call).

2-b Call Intensity

THE CALL INTENSITY is the number of calls per time unit. The time unit used is one hour. If this hour is the Busy Hour, the unit call intensity is named Busy Hour Call.

Sometimes the number of calls per day is stated, in which case it is necessary to know the concentration in order to derive the number of busy hour calls.

Since the number of calls is a pure figure, the call intensity, or calls per time unit, will have the dimension T^{-1} (T = Time).

The general symbol for call intensity is c. The unit symbol will be C/h (1 Call per Hour) or BHC (1 Call per Busy Hour).

2-c Call Concentration

THE CALL CONCENTRATION is the ratio of busy hour calls to daily calls. It usually ranges from 1/6 to 1/12, with the normal value around 1/8 (12.5%) for public telephone exchanges.

The reciprocal value is known as Length of Day and is the number by which the busy hour calls must be multiplied to arrive at calls per day.

2-d Calling Rate

THE CALLING RATE is the busy hour call intensity per subscriber line, or in general, per call originating source. Sometimes a distinction is made between originating and terminating calling rate, to discriminate between calls made and received by subscribers.

2-e Holding Time

EVERY call engages or holds a traffic path for a certain time called the HOLDING TIME. The holding time varies for each call and for each path engaged by the same call, so that in practice there is no constant holding time. In general, the Holding Time represents the **average** holding time of a large number of calls and is the **arithmetic mean.**

The holding time is given in seconds, minutes or hours and consequently its dimension is T (time).

The general symbol for holding time is t (sometimes h is used).

Although not explicitly stated, the holding time always refers to a definite group of traffic paths, i.e. a definite traffic cross-section.

2-f Traffic

TRAFFIC is the total engagement time of circuits, switches or traffic paths.

The traffic is obtained by multiplying the number of calls by the holding time of these calls. The traffic, like the number of calls, does not refer to a definite time period.

Since the traffic is obtained by multiplying a number of calls by a holding

This poster, reduced for publication, is one of the timely posters featured by the Associated Telephone Company, Ltd., Santa Monica, California.

time expressed in some time unit, it results that the dimension of the traffic is T, and that the traffic should be expressed in seconds, minutes, or preferably in hours.

These units are mostly known as call seconds, call minutes and call hours; but the addition of the word "call" is not necessary as the traffic is simply a time. The symbol for Call Minute is CM, and ccs stands for 100 Call Seconds.

2-g Traffic Intensity

THE TRAFFIC INTENSITY is the traffic per time unit. Consequently it is a pure figure, without dimension. The time unit has to be the same as the one in which the traffic is expressed.

It should be noted that the traffic intensity can be defined in various ways:

(A) Traffic per time unit (as above).

(B) Average number of paths simultaneously engaged.

(C) Average number of calls originated during a time period equal to the average holding time.

(D) Minimum number of paths required to handle a given traffic, assuming an even traffic without fluctuation.

These definitions are analyzed in detail in section 4.

The general symbol for traffic intensity will be y and the unit symbol will be Y. Sometimes m or e or a are used as general symbols.

Some authors still favor an arbitrary traffic intensity unit called Equated Busy Hour Call; one Equated Busy Hour Call (Symbol-EBHC) is equal to one 120-second call per busy hour.

Others apply the traffic units Call Hour, Call Minute and Call Second as traffic intensity units, thereby implicitly assuming that the specified amount of traffic occurs during one hour or the Busy Hour, i.e. they should put Call Hours per Hour, Call Minutes per Hour and Call Seconds per Hour (or per Busy Hour).

According to the above, the relation between these units is as expressed in the following equation:

$$Y=30\ EBHC=36\ ccs/h=60\ CM/h \quad (1)$$

It is obvious from the definition of the traffic intensity that units like Call Hours per Hour, Call Minutes per Minute and Call Seconds per Second are identical with Y, which can be considered as the natural unit. Traffic intensities expressed in Y can be introduced in the formulae dealing with probabilities of switch occupancy, simultaneity, lost and delayed calls without requiring coefficients.

2-h Traffic Concentration

THE TRAFFIC CONCENTRATION is the ratio of traffic during the busy hour to total traffic during one day. It ranges between the same limits as the call concentration, and it is generally assumed equal to the

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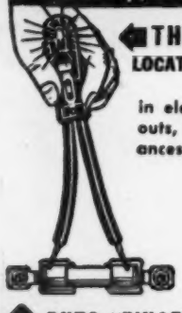

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latter, although this assumption is not necessarily correct.

2-i Traffic Rate

THE TRAFFIC RATE is the busy hour traffic intensity per subscriber line, or, in general, per traffic originating source. Sometimes a distinction is made between originating and terminating traffic rate.

2-j Busy Hour

IT IS customary to provide enough facilities in telephone exchanges to take care of the traffic intensity during the Busy Hour. The daily hour of maximum traffic intensity is subject to weekly, seasonal, yearly and, in addition, incidental fluctuations. However, the Busy Hour is not the maximum traffic hour of each day, but it is that hour which would show the maximum traffic intensity, if the traffic curves of all normal days in the course of one year were added up.

"Normal days" excludes, days with abnormal traffic conditions, as Sundays and holidays, emergencies and periods around major holidays.

The BUSY HOUR is a full, continuous period of one hour during which, on THE AVERAGE, the maximum traffic intensity of the day occurs, or can be expected.

In practice, it is sufficient to observe the traffic during the busy period, at short intervals, for 30 to 50 selected days to determine the Busy Hour. In most cases it is even not necessary to observe the traffic and it is satisfactory to plot the summation of the power consumption graphs of the exchange, recorded for these selected days.

Some traffic or switching groups can have a Group Hour which does not coincide with the general Exchange or Office Busy Hour. The Exchange Busy Hour refers to the total originating traffic of the subscribers. The existence of group busy hours in an exchange always results from obvious peculiarities in the structure of the city or telephone area; e.g. separate business and residential districts; separate harbor, banking and industrial districts, etc.

3. Comments on Definitions

OF THE TRAFFIC concepts defined above, the traffic intensity is the most important and its determination is the main object of traffic calculations. Next in importance are the call intensity and the holding time.

It is the busy hour traffic intensity, applied to probability curves or tables, which determines the number of paths required for a given loss or delay probability.

It is notable that a comparison of

DON'T BE AN ACCIDENTEE!

calls and traffic to call intensity and traffic intensity, respectively, has an electrical analogy in comparing electricity quantity, expressed in Coulombs to current intensity, expressed in Amperes.

It must be emphasized that all traffic quantities are statistical means which are obtained by averaging the results of a large number of observations and that these values are thus not constant, invariable figures.

The following example is given to remove any doubts with regard to the interpretation of the above definitions:

Assume a 2000 line telephone exchange. Each subscriber on the average originates 12 calls during one day. The busy hour lasts from 10:25 AM to 11:25 AM. The call concentration is 10%. The average holding time, over a complete day, is 132 seconds, whereas the average holding time during the busy hour is 111 seconds. Hence:

Total daily calls $= 2000 \times 12 =$ 24,000 C
Call concentration $= 10\%$
Busy hour call intensity $= .10 \times$ 24,000 $=$ 2400 BHC
Calling rate $= 2400 \div 2000 = 1.2$ BHC/line
Busy hour traffic intensity $= 2400 \times \frac{111}{3600} = 74$ Y
$(= 74 \times 30 = 2220$ EBHC)
Traffic rate $= 74 \div 2000 = .037$ Y/line
$(= .037 \times 30 = 1.11$ EBHC/line)
Total traffic per day $=$ 24,000 x 132 $=$ 3,168,000 seconds $=$ 880 hours
Traffic during busy hour $= 74 \times 1 =$ 74 hours
Traffic concentration $= 74 \div 880 =$ 8.4%

The calling and traffic rates given in the above example are the originating calling and originating traffic rates. If it is assumed that a certain part of the calls and traf-

fic, for instance 5%, are routed to special services (information, long distance, etc.) and omitting differences between outgoing and incoming traffics as well as toll switching traffic, then the terminating calling and traffic rates would be equal to 95% of the corresponding originating figures.

Since the traffic is the number of calls times the holding time, it follows that the traffic per time unit is the number of calls per time unit times the holding time, or, the traffic intensity is equal to the call intensity times the holding time (in hours), as shown in equation (2). Similarly, if dividing the holding time, instead of the number of calls, by the time, it follows that the traffic intensity for a certain time period is equal to the number of calls times the holding time expressed as a fraction of this time period taken as time unit.

The following formula represents the relation between traffic intensity y expressed in Y, holding time t expressed in hours and call intensity c expressed in BHC or C/h:

$$y = t \times c \qquad (2)$$

It is therefore sufficient to know any two of the above values in order to determine the third one.

All other traffic terms, whether referring to automatic or manual telephone service, can be reduced to one of the above definitions. For instance trunk efficiency is traffic intensity per trunk; handling time per call is operator's holding time per call; operators' load is traffic intensity handled by the operators; etc.

These definitions are also applicable, by substituting the right terms, to other traffics such as railroad, post office, street traffic, etc.

(TO BE CONCLUDED)

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A Report on Enemy Communications Equipment

"German radio equipment is five years behind our own in design, components, and construction," Captain James P. Lipp, Signal Corps, has reported to the Chief Signal Officer. This seems to be due, the Captain explained, to the fact that the Germans standardized their radio apparatus during 1934-1938 and have failed to attempt further improvements.

Captain Lipp is assigned to the Signal Section of the Allied Force Headquarters in North Africa. He recently returned to this country to submit a report on captured enemy communications equipment to the Chief Signal Officer and will return shortly to North Africa.

"There is no doubt that our radio equipment is superior in electrical design. Examination of the Nazi radio sets captured revealed them to be obsolete as compared to present American standards. The Italian radios were definitely inferior, not only to our equipment, but to their erstwhile allies' too.

"However, Jerry radio sets are mechanically well-built and have a great deal of strength. They are heavier than ours and can withstand a lot of punishment. Those that we have tested were certainly not made for Africa. They lacked waterproofing and were not dustproofed. In many cases stop-gap measures were used. For instance we have noticed that tape and various sealing compounds were used in an attempt to make sets resistant to corrosion and to exclude dust. An obvious fault was the lack of impregnation of coils and transformers to keep out moisture."

"German Signal prisoners of war whom I have had a chance to interview did not seem to be very well trained along technical lines," Captain Lipp said. 'They seem to be fairly good operators, but they do not seem very well versed in theory or in maintenance. In many cases, we have picked up radio sets that were intentionally sealed to prevent tampering so that German operators could not attempt their own repairs.

"Our own boys, of course, having 'Yankee Ingenuity,' think nothing of repairing or improving their own equipment if they have the tools and parts."

Damaged enemy equipment is cannibalized for coils, condensers, resistors, tubes, batteries, and meters. These are used to make emergency repairs on our own equipment as well as on damaged enemy apparatus to be adapted for Allied use.

Up to the present time, Captain Lipp declared, it has not been necessary to use captured equipment, since our forces have been adequately provided with communications equipment.

Although some of the captured enemy items come back to Allied Force Headquarters through regular channels, Captain Lipp and his men scout close to the front lines for finds. At one stage in the latter phase of the Tunisian campaign, they attached themselves to the British Eighth Army and were proceeding down a valley when they found themselves in the midst of an artillery duel between British and German batteries.

At one time, Captain Lipp began receiving a large amount of oval shaped instruments, tagged "loudspeakers." He soon discovered that they were really German land mines, and these misdirected instruments of destruction were immediately ordered re-routed to the Ordnance base for utilization or disposal.

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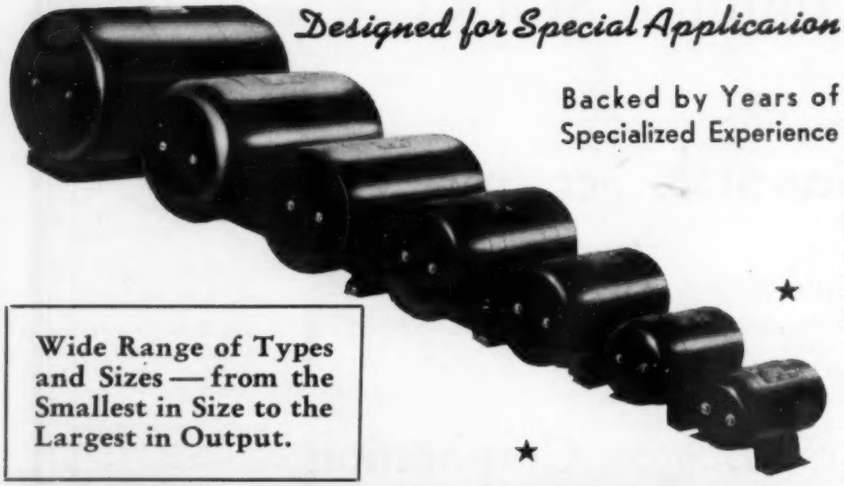

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Giant Phone Hookup For U. S. Army in Britain

London, November—The largest telephone hook-up in Britain, connecting the U. S. Army's European Theater of Operations headquarters with every Army, Navy and Air Force base—both British and American—in the country, has been provided for the American forces by Britain under reverse lend-lease.

The network's switchboard, which outrivals in size those of the British War Office and Admiralty, is housed in a bomb-proof basement; and the enormous traffic on its lines is handled by 100 British girls, all graduates of intensive training courses conducted by the General Post Office and the Ministry of Labor.

When the Americans arrived in Britain, the General Post Office, which handles all telephone services was short-staffed and hard-pressed for equipment. But it buckled down at once to the task of supplying the U. S. forces. In record time thousands of miles and hundreds of thousands of dollars worth of cables were laid, and the giant switchboards were installed.

Of these, the E. T. O.'s headquarters boasts 52 panels, a number likely to increase as U. S. Britain-based operations expand. The switchboard's efficiency is checked by a maintenance crew from the U. S. Signal Corps, on hand at all times, and by frequent once-overs by G. P. O. technicians.

The "Gibson Girl"

Recently a Skytrain transport plane, carrying 19 sick and wounded soldiers from Guadalcanal, was forced down in the South Pacific. Rescue was affected by the three members of the crew through the use of their emergency radio equipment.

The plane, 100 miles from its destination, made a forced landing on a coral reef. On the ninth day the radio messages were picked up and food was dropped to them by a plane from their own squadron. Two days later, a Navy destroyer arrived and took them off.

The radio credited with bringing succor to the stranded men is the Army's "Gibson Girl," now standard equipment on all Air Force planes making overwater flights. It was developed in conjunction with commercial radio firms, by the Signal Corps, Army Service Forces, which also procures and maintains it.

So-called because of its hour-glass figure, the "Gibson Girl" is an automatic transmitter, pre-tuned to the international distress frequency. An airman, forced down at sea, merely turns a crank, activating a keying mechanism which sends out an SOS. Since all ocean-going vessels are required to maintain a constant watch on the distress frequency, the chances of being picked up are good. When more than one receiving station picks up the call for help, the position of the survivor can be plotted through triangulation.

Weighing about 35 pounds, the set is packed in a bright yellow bag which, when parachuted from a plane about to "sit down" can be easily identified on the sea. It is unsinkable as was illustrated not long ago by a newspaper report from England telling how seven crewmen of a crippled Flying Fortress, forced down in the North Sea after a raid on Germany, were picked up after battling frigid 40-foot waves for eight hours.

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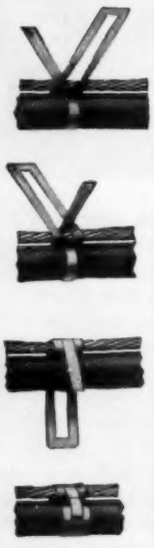

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Meet "Gerry" Berting

(This is the first of a series of background sketches on personalities in the manufacturing companies serving the Independent telephone industry.)

While on a trip through telephone manufacturing centers to the east, we ran into an old acquaintance, **Gerald A. Berting** of the North Electric Mfg. Co. of Galion, Ohio. ("Gerry" to you, which he pronounces "Jerry" as it should be written.)

Gerry Berting told us he had been moved on from sales manager to assistant to the president, and is engaged on a full-time job of coordinating development, design, production, scheduling and testing of special communications equipment for Army and Navy contracts.

Gerry is also known in W.P.B. circles where he acts as Consultant for the Communications Division in matters relating to manufacturing and production.

Gerry Berting's somewhat retiring nature belies his background and experience. A native of the Old Country, he lived in several European countries before coming to the States. He is a veteran of World War I, at the beginning of which patriotic enthusiasm drove him to enlist 3 years before attaining military age. He succeeded in convincing the recruiting officers by reason of proficiency as a telegraph operator and fluency in several foreign languages. This resulted in his seeing 4 years of active service in the British army in France and Belgium. About this he will not say much except to state that it was mostly in the Secret Service, and when asked where, he answers "Mostly in no-man's land" which is World War I's term for the territory between friendly and enemy front line trenches. He was, for a time, loaned to the French army in a liaison capacity on communications, and later helped our boys get acquainted with British wireless equipment and procedure.

He started in the wiring department of the North Co., worked through the testing and installations departments, was for a period in the laboratory, and finally in the Sales Department. His 20 years experience with this groundwork have left him with a quiet assurance in matters technical, and a sound knowledge of equipment detail. He claims he is no saleman,

G. A. (Gerry) Berting

but we who know him think that this is simply his way of saying he has to be convinced himself of the rightness of a sale or of the merit of the equipment before he is willing to try to get the customer's signature on the dotted line.

Asked what his hobby is he says somewhat ruefully that it **was** aviation, but that war work has left him no time to pursue it. The holder of a Private Pilot's license, and owner of his own plane, he was for a time Communications Officer on the local Group staff of the Civil Air Patrol. He resigned that commission to serve on the W.P.B. in Washington, D. C. He lives on a ranch near Galion where he raises Hereford cattle to help the country's meat supply.

Western Electric Booklet To 82,000 Employes

BATTLE TALK, a booklet in picture magazine form, which highlights both the record attained by Western Electric communications equipment on the war fronts of the world and the story of that Company's production since the year before Pearl Harbor, is being distributed to more than 82,000 employees, it was announced today.

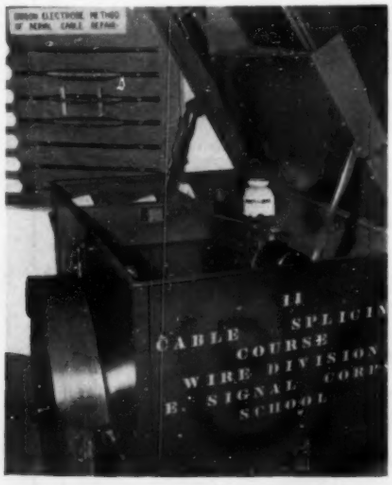
Telling its story by means of action photographs, drawings, diagrams and text, BATTLE TALK records combat incidents of land, sea and sky in which the equipment made by the Company figured prominently. Interior views of

Harold J. MacDonald, has been appointed to the position of manager jobbing sales, wire and cable department, United States Rubber Company. Mr. MacDonald, a world war veteran, has been with the company since 1920. He was eastern district sales manager of the wire and cable department since 1938.

war planes in action reveal the battle functions of airborne radio "command sets", headsets and microphones. A drawing of a modern battleship with part of its side armor stripped away demonstrates the manner in which sound powered telephones and battle announcing systems transmit vital orders aboard our warships.

Repeaters In Use

The number of telephone repeaters—boosters used in long distance circuits—in the nation-wide Bell System grew from 16 in 1908 to nearly 125,000 at present.



Fully Equipped two wheel repair cart used by the Signal Corps shown in the BACK THE ATTACK war show in Washington, D. C. This cart carries complete tools and materials for cable repairs. Note jar of Protek-Sorb Desiccant as part of equipment.

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For the convenience of readers of Telephone Engineer

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Stromberg No. 114 Double cut off jacks 10 per strip @	2.50
Stromberg No. 121 Lamp jacks with lamp caps and lamps 10 per strip @	3.00
48 volt Swbd. Lamps per 100 @	5.00
Auto Elec. All bakelite enclosed gong signal set with Straight line ringer & Cond. Less Ind. Coil @	3.25
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WANTED: Telephone Accountant—qualified to supervise all phases of telephone accounting for Class A companies. Give full information as to age, experience, draft status, etc. Attach small photograph. Telephone Services Inc., 16th Floor Lincoln Tower, Fort Wayne, Indiana.

POSITION WANTED: Thoroughly experienced and capable telephone man desires permanent connection. Qualified for assignment as plant engineer, plant supervisor or district manager. Just over draft age limit. Presently employed. Can furnish good references. Box 8320, c/o Telephone Engineer.

The Clearing House

For the convenience of readers of Telephone Engineer

Loomis Makes Change

R. T. Beard, Ft. Wayne, Indiana, eastern sales manager for the Loomis Advertising Co., telephone directory sales organization, has been made directory sales manager in charge of sales and production in the state areas served by that organization.

Mr. Beard has been associated with the Loomis company in various capacities since his graduation from the University of Kansas School of Business Administration in 1928.

Signal System, Cable and Wire Data

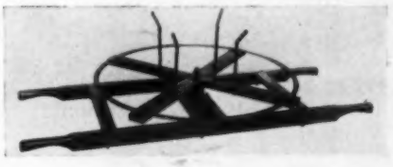
Cannon Electric Development Company, 3209 Humboldt Street, **Los Angeles 31, California,** has just published a 24-page loose-leaf booklet on Signal System, Cable and Wire Data for engineers, estimators, wiremen and the electrical industry in general.

Among the data will be found the following: standard telephone cable color code, interphone telephone cable, switchboard telephone cable, wire types used in telephone and signal installations, resistance of copper wire, carrying capacities of wires, etc.

The pages 6 x 6⅛ are 3-hole punched to fit into standard data books. Copies will be sent free upon request by mentioning TELEPHONE ENGINEER and MANAGEMENT.

New Wire Reel

A new wire reel has been developed by the W. N. Matthews Corporation, St. Louis, Mo. Its use is indicated when an efficient means of paying out wire is required. Its Catalog number is 17-A Matthews wire reel. Illustrative descriptive matter is available to our readers at no charge.



This barrow type reel is of sturdy construction and can be used for light or heavy work. The frame and cross members of the turn table are of durable white oak and base, flange and coil arm castings are certified malleable iron. Turn table revolves very easily with a full coil of wire due to the long bearing surface and large diameter of bearing base. Coil arms can be adjusted to accommodate coils of wire having inside diameters of 12, 18 and 24 inches.

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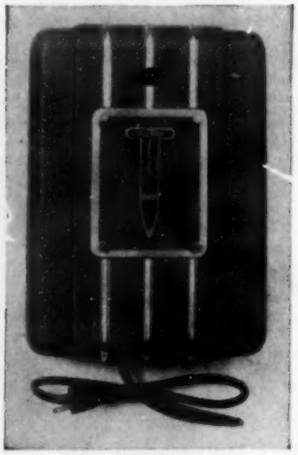

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